

cpu

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IRON MAN
LIVES AGAIN



THE NEW YEAR
ANNIHILATOR

MORE THAN THE
SUM OF ITS PARTS

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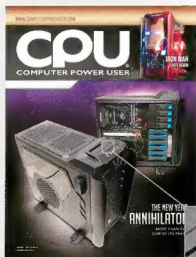
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Monthly last-page interview with people who help to shape the PC industry.

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What James Bond Can Teach Us About Guns

No matter which Bond actor you prefer, one thing all 007 fans can agree on is that the gadgets that Q cooks up for James spark the imagination. A recent article from David Gutson and Ed Finn appearing on *As We Now Think*, a website the Consortium for Science, Policy, and Outcomes at Arizona State University edits, makes a strong case for actually bringing technology from the latest Bond flick "Skyfall" to reality. The authors, in fact, write that "we should be vigorously pursuing" the gun featuring a biometric palm scanner to lock out unauthorized users. "Unlike many of Bond's gizmos, it turns out that Daniel Craig's biometric Walther PPK/S might be a very good idea," Gutson and Finn write, stating "even if smart guns disarmed only our dumbest, laziest criminals and other unauthorized borrowers like kids, the savings in lives could be tremendous." Where's Q when you need him? ■



Power Amplifiers, The Key To Doubling Smartphone Battery Power

This year, \$36 billion will go to power cellular base stations globally. That represents nearly 1% of all global electricity production, according to MIT Technology Review. A big chunk of the power, however, is wasted due to power amplifiers, a "grossly inefficient piece of hardware." Smartphones suffer from similar problems due to power amplifier chips wasting more than 65% of their energy. Enter Eta Devices, an MIT spinout company that has developed a new amplifier design that could find its way into LTE base stations in 2013, potentially cutting base station energy consumption in half. A chip-scale version of the technology is also in development that could double smartphone battery life. Reportedly, the smartphone chip will eventually see one power amplifier tackling all modes and frequencies that various global standards (CDMA, LTE, GSM, etc.) use, something that can take five chips to do in current phones. ■

WATCHING THE CHIPS FALL

Here is the pricing information for various AMD and Intel CPUs.

CPU	Released	Original Price	Last Month's Price	Online Retail Price*
AMD FX-8150 Black Edition Eight-Core	10/12/2011	\$245**	\$189.99	\$189.99
AMD FX-8120 Black Edition Eight-Core	10/12/2011	\$205**	\$159.99	\$159.99
AMD FX-6100 Black Edition Six-Core	10/12/2011	\$165**	\$119.99	\$119.99
AMD A8-3870K Black Edition Quad-Core	12/20/2011	\$135**	\$109.99	\$104.99
AMD A8-3850 Quad-Core	7/3/2011	\$135**	\$94.99	\$94.99
AMD FX-4100 Quad-core	10/12/2011	\$115**	\$109.99	\$109.99
AMD A6-3670K Black Edition Quad-Core	12/20/2011	\$115**	\$89.99	\$89.99
AMD A6-3650 Quad-Core	7/3/2011	\$115**	\$84.99	\$84.99
Intel Core i7-3960X Extreme Edition	11/14/2011	\$990**	\$1,029.99	\$1,029.99
Intel Core i7-3930K	11/14/2011	\$555**	\$569.99	\$569.99
Intel Core i7-3770K	4/23/2011	\$332**	\$319.99	\$319.99
Intel Core i7-3770	4/23/2011	\$294**	\$299.99	\$299.99
Intel Core i7-2700K	10/24/2011	\$332**	\$349.99	\$329.99
Intel Core i7-2600K	1/9/2011	\$317**	\$334.99	\$319.99
Intel Core i7-3820	2/12/2012	\$305	\$299.99	\$299.99
Intel Core i5-3570K	4/23/2011	\$225**	\$229.99	\$219.99
Intel Core i5-2550K	2/8/2012	\$225**	\$242.99	\$242.99
Intel Core i5-3550	4/23/2011	\$205**	\$209.99	\$209.99
Intel Core i3-2130	9/4/2011	\$138**	\$129.99	\$129.99
Intel Core i3-2120	2/20/2011	\$138**	\$124.99	\$124.99

* As of November 2012

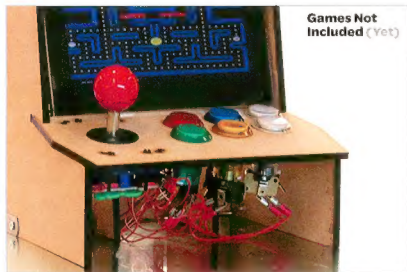
** Manufacturer's estimated price per 1,000

The Great Gatsby



Litographs: Where The Classics & T-Shirts Meet

When Danny Fein began work on Litographs a year ago, he did so "with the goal of taking the explosion of digitized text and bringing it back into the physical world." To that end, Litographs works with artists to create black-and-white and color prints by using "industrial-strength OCR software" to print the complete text of a book, character by character, to form the artist's design. Each print is 100% legible, states Litographs, which donates one book to a community in need for each print sold. In mid-November, Litographs launched a (already successful) \$15,000 Kickstarter campaign to ply its trade on T-shirts. Initially, Litographs is starting with four designs for "Alice's Adventures In Wonderland," "On The Origin Of Species," "The Great Gatsby," and "Moby Dick." Voters will determine a fifth design. ■

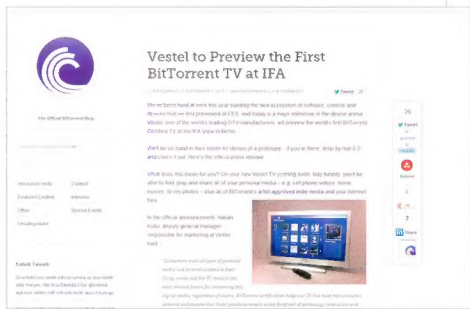


Pimoroni Wraps Mini PCs In Arcade Goodness

Speaking of Kickstarter, UK-based Pimoroni recently successfully completed its own crowdfunding campaign for the Picade, a "stylish, retro, and fun arcade cabinet" for Raspberry Pi, Mini-ITX, Pandaboard, and other mini PCs. Delivered in kit form for home assembly, the Picade and Picade Mini cabinets come with everything needed other than the mini PC. That includes an LCD panel mount with protective overlay, amplifier and speakers, headphone jack, video input socket that enables using the Picade as a second display, arcade stick, illuminated micro-switch arcade buttons, and more. Pimoroni will use the Kickstarter donations to acquire CNC routers, design and produce a custom PCB (power, controls, amplifier, and lighting circuitry included), and commission custom artwork that buyers can slap on their Picades in the form of decals. ■

BitTorrent Takes Its Streaming Software To TVs

If you're a fan of TV and BitTorrent's software, good times are approaching. In mid-November, Multichannel News quoted BitTorrent CEO Eric Klinker as saying BitTorrent had reached deals with 20 manufacturers of Internet-connected TVs, enabling future users to stream legal and illegal video via embedded BitTorrent software. Most of the deals, however, were inked with manufacturers for television sets launching in Europe and Asia, Klinker stated, so "you may not see them as much in the U.S." That's because manufacturers selling sets stateside typically already have deals with streaming video providers, Klinker stated, not because makers don't want to be associated with BitTorrent and any piracy implications its software may carry. While Klinker stated there are roughly 2 million legal titles available via BitTorrent, he had "no idea" how many illegal ones exist. ■





Stanford University Demonstrates Its Healing Ways

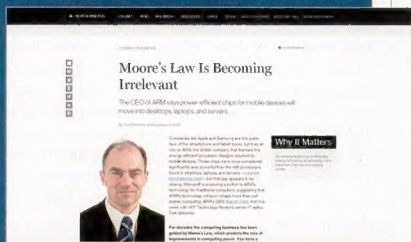
Hey, butterfingers, Stanford University chemists and engineers may soon be your best friend. According to Phys.org, the university's team has created "the first synthetic material that's sensitive to touch and can quickly heal itself repeatedly at room temperature." Similar to how human skin repairs itself, the breakthrough could enable a smartphone screen to one day do the same. Chemical Engineering Professor Zhenan Bao, the team's principal investigator, says other major advances in this field have occurred over the years, but even the most successful self-healing materials had downsides. These included a need to be exposed to high temps to work or the material's mechanical or chemical structure being altered upon repair. Stanford's team, however, combined the self-healing ability of plastic polymer and conductivity of a metal to reach "the best of both worlds." In the future, the team hopes to make its material "stretchy and transparent," thus leading to wrapping or overlaying it on electronic devices or display screens. ■

Hardware Mole



Get Ready, World; Wearable Device Sales Set To Blossom

Think all the news surrounding smart glasses is mostly hype? A recent report from Juniper Research might cause you to rethink your position. The researcher predicts the value of the next-generation wearable glasses market, which includes smart glasses, will top \$1.5 billion by 2014. That compares to the market's 2012's \$800 million value. What will drive the increase in revenue? Juniper Research cites "consumer spending on fitness, multi-functional devices, and healthcare" as the major instigators. The estimates are part of Juniper Research's "Smart Wearable Devices" report that covers 2012 through 2017. The researcher calls for 2014 to be the watershed year for wearable devices in terms of rollouts and market traction. So, exactly who will be wearing all these wearables? Juniper Research predicts North America and Western Europe will represent more than 60% of global sales. ■



Is Moore's Law Obsolete?

"Moore's Law Is Becoming Irrelevant." So reads the headline of a recent interview that MIT Technology Review conducted with ARM CEO Warren East. Upon pointing out that the computing business has been "guided by Moore's Law" for decades, whereas ARM has had a "different focus," East states "we have always been about efficiency, miles per gallon instead of top speed. That's actually what matters." That's true whether talking smartphones or servers, he says. As for servers, East says ARM is changing how people design them by making servers smaller and lower-powered. Elsewhere, East responded that the notion that ARM-based chips can't be powerful enough to support all that PCs must do as "rubbish." Traditionally ARM has found opportunities in "things like mobile phones" where high performance isn't desirable due the power or real estate consumed, but with "another design point, like a computer, the battery's going to be a lot bigger so you can use more energy." ■



Q3 2012 Highlights

- 13% of desktop networks were infected with malware in Q3 2012. That's down slightly from the 14% reported in the previous quarter.
- 6.5% of broadband customers were infected with high-level threats such as bots, rootkits, and banking Trojans.
- ZeroAccess was the most active botnet in Q3. We estimate that there are over 2 million infected users worldwide who will follow the botnet's directions.
- Users who engaged in a sophisticated ad-click fraud scheme in each day generated about 100 million fraudulent ad clicks and 200 terabytes of network traffic. Developers could be earning about \$60,000 per day.
- Android ads are the new and being distributed via Google Play. It accounts for 90% of the 14% infection rate among desktops.

ZeroAccess Botnet



2.2
Million Infected

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Malware Gets Cozy With North American Home Networks

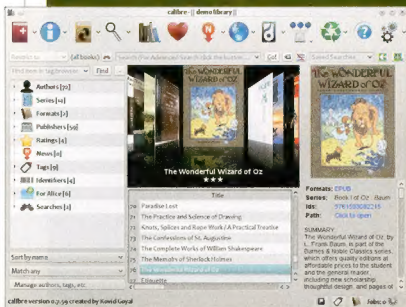
There's good news and bad news for North Americans when malware is concerned. The bad news is that according to a report from Kinsight Security covering Q3 2012, 13% of North American home networks are infected with malware. The good news is that the percentage is actually down from a 14% infection rate charted for the previous quarter. The report states that 6.5% of broadband customers have a high-level threat infection (bot, rootkit, banking Trojan, etc.) on their hands. The most active botnet for the quarter is ZeroAccess. Kinsight Security reported, which was responsible for 2 million-plus infections globally and 685,000 in the United States alone. Such bots, the security firm states, generate roughly 140 million fraudulent ad-clicks daily, along with 260TB of network traffic. ZeroAccess alone "could be costing advertisers \$900,000 per day," Kinsight Security reports. ■



3DMark Going Mobile, Cross-Platform

Sometime before the end of 2012, Futuremark plans to provide a new 3DMark version free for download that for the first time will enable measuring Windows, Windows RT, Android, and iOS device performance via scores that benchmarkers can directly compare across the four platforms. Futuremark President Oliver Baltuch says that "with three separate tests, you will be able to use 3DMark with everything from smartphones and tablets, to notebooks and home PCs, to the latest high-end, multi-GPU gaming desktops." Specifically for smartphone, tablet, ultraportable, and entry-level PC testing, an Ice Storm benchmark will provide two tests aimed at GPU performance and one physics test for CPU performance. In addition to the free 3DMark version, paid Advanced and Professional editions are planned. ■

Software Shorts

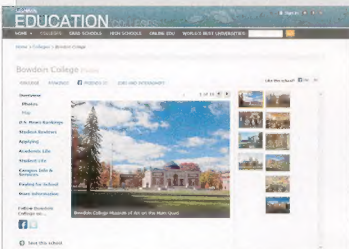


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Plugged-In Colleges

To determine which colleges do connectivity best, *U.S. News & World Report* recently created its inaugural list of Most Connected Colleges, based on the 2011-2012 academic year. The publication computed a Connectivity Index comprised of four measures (25% Internet speed, 25% Internet access, 25% applications, and 25% resources). Of 1,471 schools providing such data, 278 (19%) scored high enough to be ranked. Topping the list is Bowdoin College in Brunswick, Maine, which also ranks No. 6 among National Liberal Arts Colleges. Reportedly, students are provided 24-hour computer labs, private cloud storage, dorm room Ethernet access, and wireless access campus-wide. ■



Peak Period Traffic Composition (North America, Fixed Access)

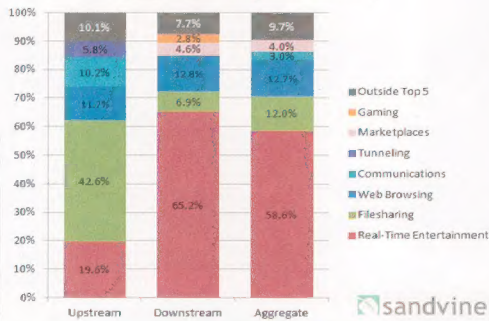
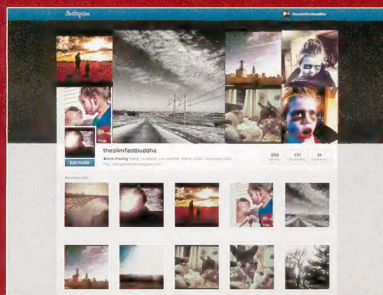


Figure 1 - Peak Period Aggregate Traffic Composition (North America, Fixed Access)

"Real-Time Entertainment" A Major Internet Hog

These are streaming times we're living in. For proof, just turn to the recently released "Global Internet Phenomena Report 2H 2012" from Sandvine, which proclaims real-time entertainment ("comprised mostly of streaming video and audio") as the largest traffic category on virtually every network Sandvine examined for the report. North America leads the world in the category, with nearly two-thirds of downstream traffic during peak usage made up of streaming audio and video. Netflix accounts for 33% of that downstream traffic during peak usage, followed by Amazon.com (1.75%), Hulu (1.38%), and HBO Go (0.52%). Across the globe, however, YouTube rates as the largest single source of real-time entertainment traffic for fixed and mobile access. BitTorrent, meanwhile, accounts for 16% of total traffic in Europe (12% in North America), but will dip to less than 10% by 2015. ■

Site Seeing



Instagram Breaks Free From The Smartphone

There's no denying that Instagram, the massively popular photo-sharing app, is one of the most successful examples of social networking yet. In August, in fact, comScore reported that Instagram topped Twitter for the first time ever in terms of daily active users to the tune of 7.3 million to 6.9 million. Unlike Twitter, however, Instagram users were exclusively confined to using the app on their smartphones. That changed in November when Instagram introduced Web Profiles, essentially giving every one of its millions of users their own web presence to display and share their photographs with others. The Web Profiles interface displays several photos above the user's profile and bio but also features follow, comment, and like abilities. Instagram users who choose to keep their account private also get a Web Profile but retain their privacy abilities. ■

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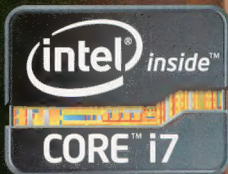
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i5-3570 3.30Ghz \$ 945
i5-3470 3.10Ghz \$ 925

i3-3220 3.30Ghz \$ 849



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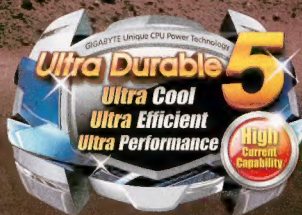
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3DMark Vantage Performance (GPU Benchmark Score)

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Overclocked on GIGABYTE A85X Motherboard

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P10000+

33% Better

FM2 A10-5800K

137% Better

FM1 A8-3870K

Overclocking configuration: GIGABYTE F2A85X-UP4, AMD APU A10-5800K at 5.2GHz by LN2 cooling; DDR3 2667MHz 2Gx2; FS# 124MHz; GPU 1591MHz; Win7(64 bit); 3DMark Vantage Performance mode (1280x1024)



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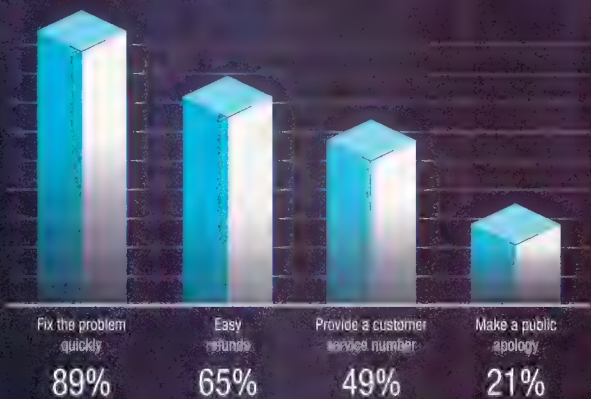
Job Of The Month

IT placement specialist Teksystems, Inc. is looking for a VMware Engineer for a "government client" in Hawaii. You'll need three to five years of experience with VMware View 5 and should be a whiz with Windows 7 and Microsoft Server OS. The job entails remotely troubleshooting connectivity and availability issues for users and monitoring systems to keep things running smoothly. You also have to set up and maintain VShield components as well as evaluate, install, test, and maintain a range of products within the Virtual Desktop Infrastructure. Oh, and you'll need a security clearance. Yes, a lot of the duties may sound like mundane tech support work, but hey, when the day is done and you've managed to save the day solving "why won't this work" problems for your customers, you can retreat to the local luau and enjoy a Mai Tai while watching the sun set over the Pacific. Talk about your stress relievers!

(For more info, see Careerbuilder.com.)

A Little Customer Service, Please

API platform company Apigee recently asked mobile app users what companies could do to appease them when an app has problems and doesn't work as well as expected. What works best? Fixing the problem—*and fast*. Here are the top four responses:



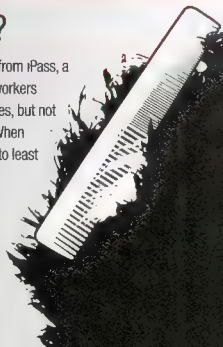
Shocking: Students Avoiding Textbooks

Students are skipping textbooks in favor of digital resources, according to a new survey by the National Education Policy Center. The survey found that 60% of students use digital resources, up from 40% in 2010. The survey also found that 60% of students use digital resources, up from 40% in 2010. The survey also found that 60% of students use digital resources, up from 40% in 2010.

Having A Bad Hair Day?

According to a recent report on the Mobile Workforce from iPass, a leading enterprise mobile services company, mobile workers prize their smartphones above other technology devices, but not as much as a few other, less-techy travel essentials. When asked to rate a handful of items from most important to least important, mobile workers ranked the items this way:

1. Wallet
2. Keys
3. Smartphone
4. Laptop
5. Tablet
6. Comb/Hairbrush



RAW
Numbers: Multi-Screen
Edition

1.85 BILLION

The projected number of online social network users in 2014

(eMarketer)

27%

Percentage of U.S. adult online shoppers who add items to their shopping cart in order to meet a minimum threshold for free shipping

(Forrester Research, Inc.)

\$62 BILLION

How much money people will spend on mobile device accessories in 2017

(ABI Research)

31.4 MILLION

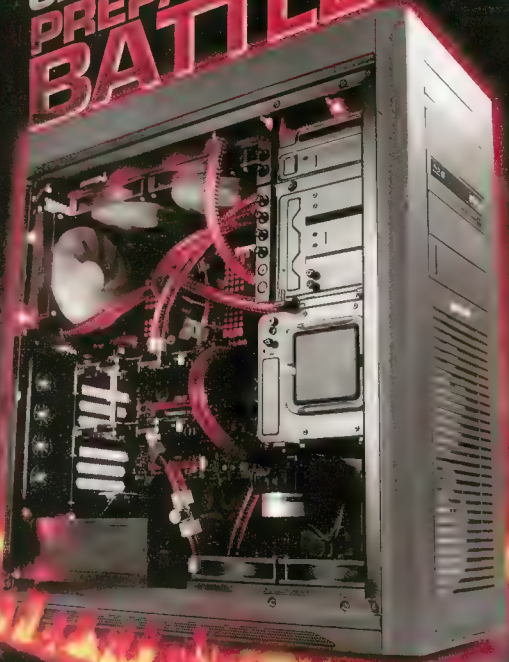
Number of hours gamers spent playing Halo 4 online during the first five days after the game's release

(Microsoft)



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3.0MP Built-in Digital Camera



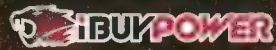
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Masters Of Memory

Patriot & Corsair Kits Go Head-To-Head

Here at *CPU*, we frequently examine a multitude of enthusiast memory kits, benchmarking each one to give you an idea which kit will deliver the best performance on a given platform, down the hundredths of a gigabit per second. What we don't do as often is review memory like you buy it, showing you entry-level, midrange, and high-end kits all in the same roundup, so you can see what kind of performance you get for your budget. That's our approach for this roundup. We're taking a look at three kits each from two of the top-tier memory manufacturers around, Patriot and Corsair.

In this roundup, we have a trio of kits off from Corsair, including Dominator Platinum, Vengeance, and Vengeance SO-DIMMs. We're also taking a look at three kits from Patriot, including a pair of dual-channel kits in the guise of and 8GB 1,600MHz and 16GB 1,866MHz Viper 3 Series kits. Patriot also sent us a quad-channel 16GB 2,133MHz kit that bears the Intel Extreme Masters Memory Limited Edition moniker.

How We Tested

Due to the wide variety of memory types, we had to get a little creative with our testing procedures. To test the desktop memory kits, we used a single platform that includes an Intel Core i7-3820 clocked at 3.6GHz in a quad channel-capable ASUS P9X79 Deluxe. We used an AMD Radeon HD 7970, a 240GB OCZ Vertex 3, and Windows 7 Enterprise 64-bit. On these kits we ran SiSoft Sandra 2012. To test the lone SO-DIMM kit from Corsair, we used the iBUYPOWER Valkyrie CZ-17 notebook we had in-house, which sports a quad-core Intel Core i7-3630QM clocked at 2.4GHz, an NVIDIA GeForce GTX 680M, 120GB Intel SSD 330, and Windows 8. Due to the different platforms, the memory scores between the DIMMs and SO-DIMM won't be directly

**8GB Viper 3 Series Viper Red
DDR3-1600 (PV38G160C9KRD)**
\$38.99
Patriot
www.patriotmemory.com



comparable, but you will get a good idea of how the kits will perform under pressure.

We ran the memory at the rated 1.5V for all kits. Before testing, we manually set the BIOS to the appropriate XMP profile that matched the memory's SPD-indicated frequency and timings, or, failing that, manually input the timings and set the frequency.

Because your memory's impact on your total system performance is largely dependent on your processor and chipset, our tests focused on synthetic benchmarks, which are designed to help you compare and contrast the kits and get a feel for the impact timings and frequencies might have on your overall system performance. We used SiSoft Sandra's Memory Bandwidth test to determine the data rate (minus the overhead) so you can see a more down-to-earth representation

of each kit's attainable throughput. Higher bandwidths are what we're looking for here. We also ran Sandra's Cache/Memory Latency test, which measures the time (in nanoseconds) it takes to transfer a block of data from main memory to the CPU. Here we're looking for lower numbers to indicate better performance. We also ran the Aliens vs. Predator benchmark at a low resolution to isolate the CPU and memory as much as possible.

Patriot 8GB Viper 3 Series Viper Red DDR3-1600 (PV38G160C9KRD)

Since 1985, Patriot Memory has been in the business of building memory modules and flash memory-based products from its manufacturing facilities in Fremont, Calif. and Taipei, Taiwan. Every memory module that bears the Patriot logo has

been certified to meet or exceed industry standards and tested to perform flawlessly and operate reliably in memory bandwidth-demanding applications.

The first kit we're taking a look at is the entry-level 8GB PC3-12800 (1,600MHz) Viper 3 Series. This one came to us with a red (called Venom Red) anodized heat shield, however, Patriot offers the same memory with a black (called Black Mamba) anodized heat shield. According to Patriot, the Viper 3 series utilizes a custom-designed, high-performance heat shield for superior heat dissipation; it's a pair of aluminum plates sandwiched around the PCB and memory chips. The PCB is just less than an inch and a quarter tall, but the heat shield adds almost another half-inch to the memory module's profile. It's not the lowest-profile kit we've seen, but it is low enough to accommodate beefy CPU coolers installed in Intel- and AMD-based DDR3-compatible motherboards. This dual-channel kit designed to operate at 1.5V and has some pretty tight timings, at 9-9-9-24. The kit consists of two modules, at 4GB each.

In the benchmarks, the XMP 1.3-certified Viper 3 Series DDR3-1600 managed 21.9GBps integer and 21.9GBps

floating point bandwidths in Sandra. In the latency test, Patriot's self-described budget performance memory kit scored a solid 23.8ns latency. In the Aliens vs. Predator benchmark, this kit helped keep the CPU busy with threads to process to the tune of 620fps.

The Viper 3 Series is currently available in dual- and quad-channel kits, in capacities of 8GB, 16GB, and 32GB. If you're building a new system or looking to upgrade the memory of an existing system, then Patriot's Viper 3 Series memory is one of the most affordable ways to go.

Patriot 16GB Viper 3 Series Black Mamba DDR3-1866 (PV316G186C0K)

Patriot classifies the next kit on offer, the 16GB PC3-15000 (1,866MHz) Viper 3 Series, as its performance kit. This one comes with a heat shield that is identical to that of the 8GB kit in every aspect except the color, which Patriot calls Black Mamba. The dimensions of the 1,866MHz kit are the same as the 1,600MHz kit, so we're looking at a higher capacity and faster version of the Viper 3 that fits just fine in AMD- and Intel-based DDR3-compatible motherboards. This dual-channel kit is XMP 1.3-certified and

consists of two 8GB modules. It runs at the same 1.5V as the previous Viper 3 we tested and it has slightly looser timings of 10-11-10-30. The 1,866MHz speed more than makes up for it, though.

In Sandra's memory bandwidth test, the Black Mamba Viper 3 scored 24.42GBps in the integer benchmark and 24.44GBps in the floating point benchmark. In the memory latency test, this kit managed to score a slightly slower 24ns, though those two tenths of a nanosecond aren't anything you'd ever be able to perceive. It's no surprise that this kit outperformed the slower one in our low-resolution game benchmark, as well, managing 8.7fps more than the DDR3-1600 Viper 3 Series kit we tested. The DDR3-1866 Viper 3 is also available in 8GB, 16GB, and 32GB capacities. If you're looking for a performance edge against DDR3-1600, then this Viper 3 Series kit from Patriot is more than capable of giving you that.

Patriot 16GB Intel Extreme Masters Memory Limited Edition DDR3-2133 (PVI316G213C1QK)

Patriot also sent us its limited edition Intel Extreme Masters Memory, which is an XMP-certified quad-channel 16GB



**16GB Viper 3 Series Black Mamba
DDR3-1866 (PV316G186C0K)**

Patriot

\$89.99

www.patriotmemory.com



**16GB Intel Extreme
Masters Memory
Limited Edition
DDR3-2133MHz
(PVI316G213C1QK)**

\$104.99

Patriot

www.patriotmemory.com

PC3-17000 (2,133MHz) kit that consists of four modules of 4GB each. This memory looks very similar to the Viper 3 Series modules we've already looked at. The aluminum heat shield on these modules is, as you might guess, a very Intel shade of blue, but the PCB underneath shares the same dimensions as the previous two kits from Patriot. The memory maker designed the Intel Extreme Masters Memory with gamers and computing enthusiasts in mind. According to Patriot, this kit was hand-tested for compatibility with the latest Intel DDR3 platforms to ensure stability for the most intense gaming environments. (We imagine it'll operate in AMD platforms, as well.) Considering the impressive speed of this kit, it comes with very respectable timings of 11-11-11-27.

Against a pair of dual-channel kits, we expected the Intel Extreme Masters Memory kit to easily dominate, and it did. In Sandra's Integer and floating memory bandwidth tests, the blue-hued kit scored 43GBps and 42.93GBps, respectively. In the memory latency test, it scored 22.5ns, the best of the batch from Patriot. In the low-resolution game test, the Intel Extreme Masters Memory kit scored 626.8fps. This

memory is available in 8GB, 16GB, and 32GB capacities and in additional speeds, including DDR3-1600 and DDR3-1866. If you're looking for a quad-channel kit for your Intel-based gaming rig, then check out this affordable Viper 3-based kit. But because it's a limited edition, you'd better get it quick.

Corsair 16GB Dominator Platinum DDR3-2133 (CMD16GX3M4A2133C9)

Since its founding in 1994, Corsair has built up a reputation as a supplier of high-performance products for PC gaming and other enthusiast pursuits. The company's arsenal now includes flash products, PSUs, solid-state drives, PC speakers, gaming headsets, gaming keyboards, laser gaming mice, system monitoring and control devices, cooling products, PC cases, and of course, memory.

The Dominator Platinum is a flagship product that shows you the advantages that come with having your hat in multiple technology rings. This 16GB kit features a customizable light bar along the top edge of the heatsink, which you can swap out with another light pipe to match the lighting in your case. The kit also utilizes DHX

(Dual-Path Heat eXchange) technology, which is designed to maximize the airflow to the PCB to maintain stability and extended use even under prolonged overclocking conditions. Corsair's Dominator Platinum memory supports Corsair Link technology, which lets Corsair Link-enabled systems display DRAM temperature and other parametric data for easier troubleshooting and precision overclocking. Corsair AirFlow fans and AirFlow Pro dynamic temperature and activity displays are also supported, for a more successful overclocking experience.

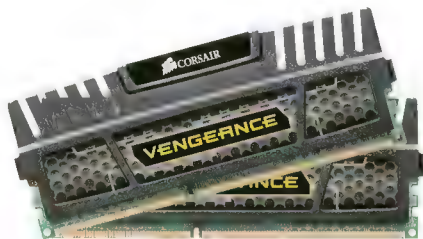
This XMP 1.3-certified 16GB kit runs at 1.5V, is clocked at 2,133MHz, and has 9-11-10-30 timings. This kit managed to post 43.39GBps in Sandra's integer benchmark and 43.5GBps floating point benchmarks. In the memory latency test, Dominator Platinum memory scored a 21.4ns. In AvP, Corsair's flagship posted 629.8fps. Corsair's DDR3-2133 Dominator Platinum kit is one that you can push to the limits in aesthetics, cooling, and speed.

Corsair 16GB Vengeance DDR3-1866 (CM216GX3M2A1866C9)

For those of us with less ample wallets, Corsair offers the 16GB Vengeance



**16GB Dominator Platinum
DDR3-2133 (CMD16GX3M4A2133C9)**
\$264.99
Corsair
www.corsair.com



**16GB Vengeance DDR3-1866
(CM216GX3M2A1866C9)**
\$104.99
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DDR3-1866 kit. This is a dual-channel kit that consists of a pair of 8GB modules. We've reviewed Vengeance memory from Corsair before, so we're familiar with the aluminum heat shield that covers the memory chips on the PCB and extends more than a half an inch above the module PCB. They're black on the kit we tested and similar in function to the Patriot kits' heat shields. Corsair's Vengeance memory is XMP 1.3-certified and are alternately available with gold, blue, and red heat shields to match your component color scheme. This kit operates at the same 1.5V as the rest we tested and it has some solid timings of 9-10-9-27.

In the benchmarks, the Corsair Vengeance DDR3-1866 kit performed well, scoring 24.57GBps and 24.54GBps in Sandra's integer and floating point bandwidth tests. It scored a 23.2ns memory latency, which puts it roughly in the middle of the pack, about where we expected it to fall. The low-resolution AvP score for the Corsair Vengeance kit was the best overall, at 629.9fps. If this kit's speed or capacity isn't what you're after, Corsair offers Vengeance memory in a range of capacities from 4GB to 64GB, channels (dual, triple, quad), and speeds between 1,600MHz and 2,400MHz. Gamers and enthusiasts looking for a lot of memory for not too much cash will find a lot to love about the Corsair Vengeance DDR3-1866 kit.



**16GB Vengeance SO-DIMM
DDR3-1600 (CMSX16GX3M2A1600C10)**
\$99.99
Corsair
www.corsair.com

Corsair 16GB Vengeance SO-DIMM DDR3-1600 (CMSX16GX3M2A1600C10)

Traditionally, those who've decided to make the leap to a notebook for work or play (or both) have had little reason to read our memory roundups and reviews. That's not the case this time. Corsair sent us a SO-DIMM kit of its Vengeance DDR3-1600 memory that is ideal for upgrading your DDR3-capable notebook. This 16GB kit consists of a pair of 8GB modules that operate at 1.5V. The timings on this kit are 10-10-10-27.

In the benchmarks, the dual-channel iBUYPOWER Valkyrie CZ-17 achieved integer and floating point memory bandwidths of 20.87GBps and 20.89GBps, respectively, which was an improvement over the stock memory that shipped with the unit. In the memory latency test, the CZ-17 scored 26.8ns. In the low-resolution game benchmark, the Corsair Vengeance notebook memory scored 362.5fps. Although that's a far cry from the other scores in this roundup,

keep in mind we are testing this kit with a 2.4GHz Intel Core i7-3630QM, which is more than 1GHz slower than the one in your desktop test system. Compared to the memory that shipped with the Valkyrie CZ-17, the Corsair Vengeance kit manages to add 2.5fps to the scoreboard.

If your notebook is in serious need of a memory upgrade, then Corsair's Vengeance SO-DIMMs are an ideal option, and Corsair offers kits of any capacity and speed you could want.

Memorable Memory

The memory modules covered in this roundup have you covered, whether you're in the market for some new gaming rig RAM, notebook SO-DIMMs, or a rock-bottom price on a competent kit. Now's a great time to buy memory, and armed with these scores and more, you can make sure your next purchasing decision is a well-informed one. ■

BY ANDREW LEIBMAN

	Patriot Viper 3 Series Black Mamba DDR3-1600	Patriot Viper 3 Series Black Mamba DDR3-1866	Patriot Intel Extreme Masters Memory Limited Edition DDR3-2133MHz	Corsair Dominator Premium DDR-2133	Corsair Vengeance DDR3-1866	Corsair Vengeance SO-DIMM DDR3-1600
Benchmark Results						
Price	\$38.99	\$89.99	\$104.99	\$264.99	\$104.99	\$99.99
Timings	9-9-9-24	10-11-10-30	11-11-11-27	9-11-10-30	9-10-9-27	10-10-10-27
Voltage	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V
Kit capacity	8GB	16GB	16GB	16GB	16GB	16GB
Sandra 2012 Lite Memory Bandwidth						
Integer Buffered AVX/128 (GBps)	21.9	24.42	43	43.39	24.57	20.87
Float Buffered AVX/128 (GBps)	21.9	24.44	42.83	43.5	24.54	20.88
Sandra 2012 Lite Memory Latency	23.8ns	24ns	22.5ns	21.4	23.2	26.8
Game						
Alien vs. Predator	620fps	628.7fps	628.8	629.8	629.9	362.5
Test system specs: CPU: Intel Core i7-3630 (3.6GHz); Motherboard: ASUS P9X79 Deluxe; Graphics: AMD Radeon HD 7970; Storage: 240GB OCZ Vertex 3; Display: Dell 3007/WFP; Windows 7 Enterprise 64-bit						

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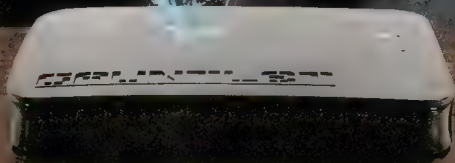
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Rosewill Tachyon-1000

Fans of "Star Trek" will recall that tachyons are particles capable of facilitating great feats, such as time travel and detecting cloaked Romulan ships. Tachyons have also made appearances in classics such as "Babylon 5," "Watchmen," and "Fantastic Four." The Rosewill Tachyon-1000 borrows the name to provide us with something a bit more tangible—a partially modular, 80 PLUS Platinum-certified power supply with support for triple SLI or CrossFire.

The hardwired cables on the Tachyon-1000 include the 20+4-pin main power cable, two EPS12V cables (one 4+4-pin and one 8-pin), and one PCI-E cable with two 6+2-pin connectors. The remaining four PCI-E cables—each with one 6+2-pin connector—are modular. For your system peripherals, there are 10 SATA connectors, five Molex connectors, and one FDD connector. All of the cables feature thick rounded mesh sleeves. The unit is 8.1 inches long, including cable bend.

Rosewill designs the Tachyon-1000 with one +12V rail that can handle up to 83A, which equals a maximum 996 watts. Both the +5V and +3.3V supply up to 20A each, for a combined power of 100 watts. Rosewill indicates that it tests the Tachyon-1000 to deliver

1,000 continuous watts at 50 degrees Celsius. To protect the hardware within your system, the Tachyon-1000 features overcurrent/voltage/power, undervoltage, and short circuit protection. To improve efficiency, Rosewill uses a 140mm fan with automatic speed control. We noticed that the fan didn't kick on until we started our heavy load applications, so the Tachyon was silent during much of our testing.

We installed the Tachyon-1000 into a system running Intel's Core i7-3770K on a GIGABYTE GA-Z77X-UP7 motherboard. For graphics power, our system included two ZOTAC GeForce GTX 580s. To test the system, we simultaneously ran POV-ray Beta 3.7 (stresses all CPU cores) and the Aliens vs. Predator (stresses GPU, all settings maxed at 2,560 x 1,600). In SLI, the Tachyon-1000 posted a power factor of .979 when running at a maximum wattage of 644W. With one GTX 580, we saw a maximum wattage of 437W and a power factor of .978.

Although the Tachyon-1000 doesn't show off any miraculous sci-fi capabilities, we came away impressed with its performance and efficiency under load. There are enough connectors to support most any high-end build, and with its five-year warranty, you can expect the

Tachyon-1000 to power that build for a long time. ■

BY NATHAN LAKE

Specs	Rosewill Tachyon-1000
Rated continuous (W)	1000 (at 50 C)
12V Rails	1
+12V max (A)	83
+5V max (A)	20
+3.3V max (A)	20
SLI/CrossFire-ready	Yes
Max wattage tested	644
Power factor tested	.979
Efficiency rating (as advertised)	87 to 92%
Fan	140mm
PCI-E	6 (6+2-pin)
Main 12V	20+4-pin
8-pin EPS 12V	2 (1 8-pin, 1 4+4-pin)
SATA	10
4-pin Molex	5
Floppy	1
Length (including cable bend)	8.1 inches
Warranty	5 years

Test system specs: Processor: Intel Core i7-3770K; Motherboard: GIGABYTE GA-Z77X-UP7; GPU: ZOTAC GeForce GTX 580 (2x, SLI); RAM: 16GB Kingston HyperX Predator DDR3-1868; Storage: 128GB Crucial RealSSD C300; OS: Windows 7 Enterprise (64-bit)



Fractal Design Node 605

The first thing you'll notice about the Fractal Design Node 605 is the simple design and the brushed steel look of the front panel. But if you don't look carefully, you might miss the semi-hidden access door that runs along the bottom of the front panel and covers the USB 3.0, FireWire, and audio ports, as well as the optional slimline optical drive bay and a multi-format memory card reader.

The component-width case will integrate well into your entertainment center and comfortably become a part of your overall home theater system. Also, everything about the Node 605 is designed to be quiet, from the two included Silent Series R2 fans to the sound-dampening materials built into the underside of the top panel and in other parts of the case.

When it comes to components, the Node 605 is more flexible than most. It can support full ATX, mATX, Mini ITX, and DTX motherboards, although if you want to install a slimline Blu-ray or DVD drive space constraints will limit your choices to mATX or smaller boards. The Node 605 can also hold up to four 2.5/3.5-inch HDDs or SSDs.

And depending on your hard drive configuration, it will also support some 7 to 7.5-inch PSUs.

When you lift off the top panel, you might be surprised to see just how much space is available inside the Node 605; not only do you have the option of removing one of the white metal hard drive mounting brackets to free up space, but you also have options for graphics cards, as well. For instance, the Node 605 can support graphics cards from 7 inches up to just over 11 inches in length, depending on your chosen hard drive configuration and which of the seven expansion slots you decide to use. The takeaway here is that you have options—options that many small form factor cases don't provide.

In addition to being quiet and highly customizable, the Node 605 also supports quite a few cooling configurations. You can add as many as three additional fans, and the case ships with a three-channel fan controller

located on the right side panel. The side fans all have removable air filters as well, so it's easy to keep the air flowing smoothly. The case also supports 125mm CPU coolers with side-mounted fans, but if you prefer a top-mounted fan configuration, Fractal Design recommends you leave at least 30mm for proper airflow.

It's safe to say that Fractal Design has hit another home run with the Node 605. The simple, yet elegant style, brushed metal front panel, multiple ports, and media card reader make it a great addition to any home theater system. And the various configuration options make it a constantly tinkering HTPC enthusiast's best friend. ■

BY JOSH COMPTON

Node 605
\$159.99
Fractal Design
www.fractal-design.com

Specs: Dimensions: 6.4 x 17.5 x 13.7 inches (HxWxD); Motherboard support: ATX, mATX, Mini ITX, DTX; Bays: 4 internal 2.5/3.5-inch SSD/HDD, 1 external slimline ODD (with mATX or smaller MB); Fans (included): 2 side 120mm; Fans (optional): 1 side 120mm, 2 rear 80mm; Ports: 2 USB 3.0, 1 FireWire, audio I/O

Corsair Hydro Series H100i

The Hydro Series H100i takes the place of Corsair's Hydro Series H100 as the company's flagship high-performance liquid-cooler. Similar to the H100, the H100i provides you with a closed-loop cold plate/pump combo that pushes coolant through a 240mm radiator that's cooled by two 120mm fans. The biggest enhancement found in the H100i is its ability to connect with Corsair's Link V2 software, so you'll just need to connect the Corsair Link cable to a USB header on your motherboard to see current temperatures, adjust fan speeds, and change lighting. Corsair has also re-engineered many of the cooler's other components to increase performance and reduce noise.

To improve efficiency, Corsair has increased the outer diameter of the tubing to 14.3mm and changed to a proprietary rubber that offers low permeability to ensure minimal coolant evaporation. Overall, the tubing change allows for better coolant flow and greater tubing flexibility. Corsair also changed the cooler's fans, equipping the H100i with fans based off its Air Series SP120 retail models, which feature high-torque motors that are designed for use with static pressure situations, such as when a fan is placed against a radiator. Corsair indicates that fans have a max speed of 2,700rpm. The cold plate/pump unit features two micro USB connectors that let you attach the included Corsair Link digital USB connector, as well as another Corsair Link device, such as a Corsair AXi power supply, LED strips, or AirFlow Pro RAM fans.

We installed the H100i into a Corsair Graphite Series 600T, which worked well because the top panel has mounts to install the 240mm radiator and perforated holes that offer ample ventilation. The H100i is compatible with Intel LGA1155/1156/1366/2011 and AMD AM2/AM3/FM1/FM2 processor sockets. Installation of the cold plate/pump was



similar to the rest of the closed-loop coolers we've tested, as we just needed to find the appropriate mounting bracket, place it over the cold plate/pump, and screw it to the backplate.

Corsair's Link V2 software provides a lot of helpful functionality for enthusiasts and gamers. On the System page, the H100i will list the current fan speeds, pump speed, CPU temperature, pump temperature, and color of the LED. The latter is especially customizable, because you can mix the red, green, and blue levels to create a custom color. You can even have the colors change with the CPU temp to serve as an indicator light. The Configuration Panels for each fan let you individually control speed based on CPU temps.

In testing, the H100i produced an idle temperature (tested after letting our test system idle for 30 minutes) of 29 degrees Celsius with Intel's Core i7-3770K. To test the H100i under load, we ran POV-Ray 3.7 Beta and Prime95.

After looping the POV-Ray test three times, we saw a maximum temperature of 54 C, which is a few degrees lower than what we've seen for the Core i7-3770K with previous closed-loop coolers. We then ran four instances of Prime95, using the Small FFT test for 10 minutes, and saw temps of 56 C—also a few degrees lower than previously tested CPU coolers.

We came away impressed with the H100i's performance and found it easy to install, as well. We think that modders will like the ability to change the color of the LED in the pump, and enthusiasts should appreciate the extra control the Corsair Link software affords. ■

BY NATHAN LAKE

Hydro Series H100i

\$119.99

Corsair

www.corsair.com

Specs: Materials: Copper (cold plate), aluminum (radiator); Socket compatibility: Intel LGA1155/1156/1366/2011, AMD AM2/AM3/FM1/FM2; Fans: 2 120mm (2,700rpm max speed), Radiator: 240mm; Warranty: Five-year warranty.

Test System Specs: Processor: Intel Core i7-3770K; Motherboard: GIGABYTE GA-Z77X-UP7; GPU: ZOTAC GeForce GTX 580 (2x, SLI); RAM: 16GB Kingston HyperX Predator DDR3-1866; Storage: 128GB Crucial RealSSD C300; OS: Windows 7 Enterprise (64-bit)

Intel SSD 335 Series 240GB

We've taken a look at a number of SSDs lately, and Intel's offerings have always performed well in our benchmarks. The company's impressive warranties have also been some of the best in the industry, giving them a bit of an edge. Intel's latest drive is the 335 Series, which currently consists of a lone 240GB model, but we suspect Intel may release more capacities in the coming months.

This SSD features Intel's latest 20nm MLC NAND. It's meant to replace the mainstream Intel SSD 330 Series, which are composed of 25nm NAND. Despite the new process, Intel outfitted the 335 with the same controller that the 330s and the more performance-minded 520 SSDs rely on, the SandForce SF-2281. Just like the 330s, each of the 335's flash chips consists of an 8GB die with an 8KB page size. As you might expect, the 335 is not a massive overhaul of the 330, and as such, the performance lines up with the former drive in sequential and random reads and writes. The most impressive feature of the drive is its lower price, relative to the 330s.

Intel SSD 335 Series features a 6Gbps SATA interface that helps the drive achieve up to 500MBps sustained sequential reads, 450MBps sustained sequential writes, random 4K reads up to 42,000 IOPS, and random 4K writes up to 52,000 IOPS. This drive has a standard 2.5-inch SSD form factor, but it comes with an adapter to accommodate 3.5-inch drive bays. The SSD also comes with Intel SSD Toolbox with Intel SSD Optimizer software, which lets you manage, diagnose, and troubleshoot the drive. Intel Data Migration Software, which is a cloning tool that lets you simplify the process of upgrading your PC's storage, is also included. The Intel SSD 335 Series

comes with a solid three-year warranty and has a MTBF of 1.2 million hours.

To test this SSD, we ran CrystalDiskMark 3.0.1 at both the default setting, which is the more demanding test because of its use of incompressible data, and using the All 0x00 (0 Fill) setting, which incorporates compressible data for a more peak performance rating. We also ran the AS-SSD benchmark, which, like CrystalDiskMark's default setting, focuses on incompressible data and therefore gives us an idea of how the SSD will perform under a worst-case scenario.

Intel's SSD 335 Series drive scored 517MBps and 478.98MBps when reading sequential incompressible data in CrystalDiskMark and AS-SSD. This drive's sequential writes weren't far behind, at 345.6MBps and 326.58MBps in the respective benchmarks using incompressible data. In CrystalDiskMark's All 0x00 (0 Fill) test, the 335 Series managed to post sequential reads at 472.2MBps and sequential writes at 517.6MBps. The 4K random read/write scores of 21.49MBps and 94.29MBps in AS-SSD show where the 335 Series falls short compared to the 520 Series, but the price differential makes the Intel 335 Series attractive for anyone making the jump from a mechanical HDD or upgrading a smaller SSD from a few years ago. ■

BY ANDREW LEIBMAN

SSD 335 Series 240GB

\$184

Intel

www.intel.com

Benchmark Results		Intel 335 Series SSD 240GB
CrystalDiskMark 3.0.1		
Sequential read		517
Sequential write		345.6
512KB random read		452.2
512KB random write		343.9
4KB random read QD1		27.44
4KB random write QD1		12.75
4KB random read QD32		215.6
4KB random write QD32		302.6
CrystalDiskMark 3.0.1 All 0x00		
Sequential read		472.2
Sequential write		517.6
512KB random read		446.1
512KB random write		301.9
4KB random read QD1		37.74
4KB random write QD1		13.3
4KB random read QD32		333.2
4KB random write QD32		371.4
AS-SSD		
Sequential read		478.98
Sequential write		326.58
4K read		21.49
4K write		94.29
4K-64Thrd read		215.7
4K-64Thrd write		275.2
*Results in MBps		
Test system specs: CPU: Intel Core i7-3820 (3.6GHz); Motherboard: ASUS P9X79 Deluxe; RAM: 16GB Patriot Viper Xtreme DDR3-1866; Graphics: AMD Radeon HD 7970 3GB; Windows 7 Enterprise 64-bit		
Specs: Maximum sequential read/write: 500MBps/450MBps; Maximum random 4K read/write: 42,000IOPS/52,000IOPS; Interface: 6Gbps SATA; Three-year warranty.		

Supermicro 5037A-i

The 5037A-i from Supermicro is a mainstream workstation that includes an Intel Xeon processor, up to 256GB of ECC registered memory, and up to two NVIDIA Quadro graphics cards. You can customize the system to suit your particular budget and needs. The 5037A-i also comes with Supermicro's computer health monitoring tools that keep track of CPU core temperatures, memory voltages, and chipset voltages. It also provides thermal control for the motherboard's five fan connectors.

The system sent to us was built with an Intel Xeon E5-1650, 16GB of ECC registered DDR3, and an NVIDIA Quadro 5000. Supermicro installed these high-performance components in a black steel midtower, so it's a sturdy system. The front chassis features two USB 3.0 ports, two USB 2.0 ports, and audio I/O.

On the interior, there's space behind the drive cage to add a 120mm fan, if you need more airflow. A 120mm rear exhaust fan aids the CPU cooler in expelling heat generated by the CPU, memory, and motherboard components. Supermicro cleanly routed the cables to optimize airflow and make it easy to work inside the case.

Supermicro has also designed the 5037A-i with reliability in mind. Our test build featured a 500GB Seagate Enterprise drive. The use of ECC registered memory provides the server-grade reliability you'll want in a workstation. The 5037A-i is also quiet, as the rear exhaust fan should never exceed 21dB during operation. For efficiency, Supermicro uses a 900W power supply that meets the 80 PLUS Gold certification.

The majority of the cost that went into this build is the Quadro 5000, so we benchmarked the system with SPECviewperf 11 to test its capabilities. This synthetic test is designed to push the kinds of loads you'd experience when rendering video and other 3D content. The 5037A-i turned in impressive results of 45.76 in catia-03, 40.92 in lightwave-01, 54 in maya-03, and 40.95 in sw-02. The Intel Xeon E5-1650 also posted high marks, with 392.54 MPixels per second in SiSoftware Sandra's x16 Multi-Media Float iAVX test. It showed well in Cinebench 11.5 and POV-Ray 3.7 Beta, too, scoring 8.53 and 1514.57 pixels per second, respectively.

This workstation provides you a processor and graphics card you need to power through tough rendering tasks. There's plenty of upgradeability here, too, making the 5037A-i a workstation you'll be able to use for years. ■

BY NATHAN LAKE

5037A-i

\$2,888.70 (as tested) | Supermicro
www.supermicro.com



Benchmark Results	Supermicro 5037A-i
3DMark 11 Extreme	
3DMark Overall	X1005
Graphics Score	838
Physics Score	10456
Combined Score	1270
Graphics Test 1	4.56
Graphics Test 2	4.61
Graphics Test 3	4.48
Graphics Test 4	2.62
Physics Test	33.19
Combined Test	5.91
PCMark 7	
Overall	3262
Productivity	2216
Creativity	2246
Entertainment	3455
Computation	3522
System Storage	1654
SiSoft Sandra 2012 SP1 1.18	
Processor Arithmetic	
Dhrystone SSE4.2 (GIPS)	18193
Whetstone SSE3 (GFLOPS)	1178
Processor Multi-Media	
x16 Multi-Media Integer iAVX (MPixels per second)	381.1
x16 Multi-Media Float iAVX (MPixels per second)	392.54
x8 Multi-Media Double iAVX (MPixels per second)	223.67
Cinebench 11.5	
CPU*	8.53
POV-Ray 3.7 Beta**	1514.57
SPECviewperf 11	
catia-03	45.76
ensight-04	39.67
lightwave-01	40.92
maya-03	54
proc-05	9.34
sw-02	40.95
tcvis-02	37.79
snx-01	67.83
* points	
** pixels per second	
Test system specs: Processor: Intel Xeon E5-1650 @ 3.2GHz (3.8GHz Turbo); Motherboard: Supermicro X9SRA; GPU: Nvidia Quadro 5000; RAM: 16GB DDR3-1600 ECC registered server memory; Storage: 500GB Seagate Enterprise; OS: Windows 7 Ultimate (64-bit)	

Gigabyte GV-F2A85X-UP4

GIGABYTE recently sent us one of its latest AMD FM2-based motherboards, the GA-F2A85X-UP4. This board is built around AMD's A85X chipset, making it the first Trinity platform we've had a chance to test in-house. This chipset brings a number of new things to the table compared to the A55 and A75 chipsets. For instance, the chips supports up to eight SATA 6Gbps ports running from the AMD chip. GIGABYTE chose to give you seven 6Gbps SATA ports on the board and uses the eighth as a 6Gbps eSATA port on the rear I/O. Like the A75 chipset, the A85X utilizes FIS-based switching, which works hand-in-hand with NCQ (native command queuing) to let the storage controller communicate between two or more disks at the same time. Another holdover from the A75 (missing from A55) is the four USB 3.0 ports. In addition, GIGABYTE adds an Etron EJ168 controller for two more USB 3.0 ports on the front panel. The F2A85X-UP4 supports a total of 10 USB 2.0 ports. The A85X gives GIGABYTE a little more flexibility when it comes to splitting up the PCI-E lanes; there are 3 PCI-E x16, one that runs at x16, a second that runs at x8, and a third that runs at x4. With two graphics cards installed in CrossFire, the top two slots run at x8.

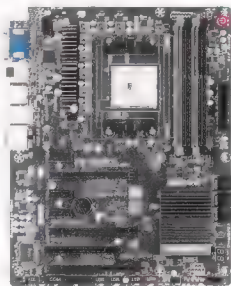
GIGABYTE's board can handle up to 64GB of 1,866-MHz DDR3 memory, and it supports AMD Memory Profiles and XMP modules to run at those

speeds. There's a Realtek ALC892 codec onboard to handle the audio processing and another Realtek chip for the Gigabit Ethernet; the 8111E.

As you'd expect, this GIGABYTE motherboard supports a host of features you won't find anywhere else. As an Ultra Durable 5-based motherboard, it has GIGABYTE's Digital Power Engine, which is designed to deliver precise and stable power to the CPU and onboard graphics for a more fruitful overclocking experience. Other aspects of this UD5 board include IR3550 PowIRstage ICs from International Rectifier, 2X Copper PCB, and high current ferrite core chokes rated up to 60A. Together, these extras combine to give you cooler temperatures under load and more consistent and reliable overclocks. This motherboard also features an intuitive 3D BIOS interface, Dual UEFI BIOS, and Lucid Virtu MVP, which is a GPU virtualization technology designed to improve video playback, response times, frame rates, and more.

In the benchmarks, GIGABYTE's F2A85X-UP4 and an AMD A10-5800K post some good scores in a number of the synthetic and real-world benchmarks. One of the best things about this board, aside from the extras we've already mentioned, is the rock-bottom price; this motherboard makes an impressively feature-rich platform for your next budget gaming rig. ■

BY ANDREW LEIBMAN



GV-F2A85X-UP4

\$129.99

GIGABYTE

www.gigabyte.us

Specs: Max memory: 64GB (DDR3-1866); Slots: 1 PCI-E x16, 1 PCI-E x16 (x8 speed), 1 PCI-E x16 (x4 speed), 3 PCI-E x1, 1 PCI; Storage: 7 SATA 6Gbps, 1 eSATA 6Gbps; Rear I/O: 1 eSATA 6Gbps, 2 USB 2.0, 4 USB 3.0, PS/2, DVI, VGA, HDMI, DisplayPort, optical S/PDIF audio, Gigabit LAN, 7.1-channel analog audio jacks

3DMark 11	GIGABYTE GA-F2A85X-UP4
Overall (Performance)	P5524
Graphics Score	1335
Physics Score	4647
Combined Score	3913
Graphics Test 1	37.47
Graphics Test 2	22.9
Graphics Test 3	40.98
Graphics Test 4	20.06
Physics Test	12.88
Combined Test	18.20
PCMark 7	
Overall	4331
Productivity	4357
Creativity	4357
Entertainment	4136
Computation	4157
System Storage	4626
SiSoft Sandra Lite 2012	
Processor Arithmetic	
Dhrystone Native SSE4.2 (GIPS)	17.98
Whetstone Native SSE3 (GFLOPS)	22.4
Processor Multimedia	
Integer Native x16 AVX (Mpixels/s)	26
Float Native x16 AVX (Mpixels/s)	26
Double Native x8 AVX (Mpixels/s)	26
Float/Double Native x8 AVX (Mpixels/s)	26
Memory Bandwidth	
Integer B/F AVX/128 (GBps)	18.8
Float B/F AVX/128 (GBps)	18.8
Media Transcode	
Transcode H264 > H264 (KBps)	3.6
Transcode WMV > H264 (KBps)	368
Cinebench 11.5	
CPU**	3.3
POV-Ray 3.7 Beta	
Render All CPUs***	694.41
Games*	
Aliens vs. Predator (Very HQ, Shadows High, 4XAA, 16XAF, SSAO On, HW Tess, Adv. Shadows)	
Metro 2033 (DX11, Very High Quality, 4X MSAA, 16XAF, DOF off)	22
Test system specs: Processor AMD A10-5800K; GPU: NVIDIA GeForce GTX 580; RAM: 16GB Corsair Vengeance DDR3-1866; Storage: Corsair Neutron Series 240GB; Windows 7 Enterprise 64-bit	
* Frames per second	
** Points	
*** Pixels per second	

iBUYPOWER Valkyrie CZ-17

Any power users have probably been listening with some trepidation to all the hype for those trendy new thin and light notebooks. After all, a notebook with sub-inch-thick housing, a screen that's less than 1080p, and a low-wattage CPU can't aspire to satisfy even the most forgiving enthusiast's expectations. Thankfully, iBUYPOWER stepped in to allay our fears; the enthusiast notebook is alive and well, and it looks awesome.

iBUYPOWER built the desktop replacement-class Valkyrie CZ-17 around an MSI whitebook. We've long been fans of MSI's notebooks, and the same attention to detail is evident in the construction of the Valkyrie CZ-17. The back of the screen has a brushed black aluminum finish with backlit blue stripes flanking an attractive backlit iBUYPOWER cat logo in red. The keyboard is also backlit in blue, and there's an illuminated blue accent along the top edge of the mouse buttons. This notebook features a full-sized keyboard and number pad. The expansive wrist rest area features a piece of brushed aluminum to match the cover, and the mouse touchpad is large and has well-defined edges.

At the top of the brilliant 17.3-inch LED-backlit screen, you'll find a

3MP webcam and a built-in mic. Two large speakers, with their own LED accents, reside near the hinge, and a subwoofer can be found underneath the unit, toward the rear of the Valkyrie. In testing games and media, we found the speaker system to be powerful enough to rattle the desk. The left edge of the Valkyrie features analog audio ports for 5.1 surround sound speaker systems, a trio of USB 3.0 ports, and a 4-in-1 card reader. The right side of the Valkyrie CZ-17 features an 8X DVD+/-RW optical drive and a pair of USB 2.0 ports. A Kensington lock, power port, RJ-45 Ethernet port, VGA port, eSATA port, and a full-sized HDMI port can be found on the back edge.

Despite the impressive exterior, it was what was under the hood that really impressed us. There's an Intel quad-core Core i7-3630QM processor clocking in at 2.4GHz, an NVIDIA GeForce GTX 680M with 4GB of dedicated video memory, 16GB of G.SKILL DDR3-1600 RAM, a nimble 120GB Intel SSD 330 for the Windows 8 installation, a 750GB 7,200rpm HDD for storage, 802.11b/g/n and Bluetooth wireless options, and a Killer E2200 network card.

After taking a quick look at the scores, it's evident that notebooks can still tackle the latest games and enthusiast applications, with little compromise. Yes, this notebook eats those wafer-thin notebooks for breakfast. ■

BY ANDREW LEIBMAN

Valkyrie CZ-17
\$1,799 (as tested)
iBUYPOWER
www.ibuypower.com

Specs: Processor: Intel Core i7-3630QM (2.4GHz, quad-core); Display: 17.3 inches (1,920 x 1,080), LED-backlit; Graphics: NVIDIA GeForce GTX 680M; RAM: 16GB G.Skill DDR3-1600; Storage: 120GB Intel SSD 330, 750GB 7,200rpm HDD; Networking: Bluetooth, 802.11b/g/n; Dimensions: 2.2 x 11.3 x 16.9 inches (HxWxD); Weight: 6.9lbs.; OS: Windows 8

Benchmark Results		iBUYPOWER Valkyrie CZ-17
3DMark 11		
Overall		P6129
Graphics Score		6095
Physics Score		7529
Combined Score		4960
Graphics Test 1 (fps)		29.37
Graphics Test 2 (fps)		28.47
Graphics Test 3 (fps)		37.68
Graphics Test 4 (fps)		18.12
Physics Test (fps)		23.9
Combined Test (fps)		23.07
PCMark 7		
Overall		5291
Productivity		4700
Creativity		3417
Entertainment		4917
Computation		11608
System Storage		5246
SiSoft Sandra 2013		
Processor Arithmetic		
Dhrystone Integer Native SSE4.2 (GIPS)		126.38
Whetstone Double Native SSE3 (GFLOPS)		81
Processor Multi-Media		
Integer x16 AVX (Mpixels/s)		187.36
Float x16 AVX (Mpixels/s)		266.34
Double x8 AVX (Mpixels/s)		149.41
Memory Bandwidth		
Integer Buffered iAVX/128 (GBps)		20.74
Float Buffered iAVX/128 (GBps)		20.74
Cinebench 11.5		
CPU*		6.42
POV-Ray 3.7 Beta**		115707
CrystalDiskMark 3.0.1		
Sequential read		484.9
Sequential write		163.6
512KB random read		419.4
512KB random write		163.1
4KB random read QD1		273.2
4KB random write QD1		46.3
4KB random read QD32		158.2
4KB random write QD32		162.9
Allens vs. Predator		
(Very HQ, Shadows High, 4XAA, 16XAF, SSAO On, HW Tess., Adv. Shadows)		34.3fps
Unigine Heaven 2.5 (FPS)		33.2
FPS Score		896
* Points ** Pixels per second		

Zalman LQ320

Don't look now, but Zalman is becoming a serious player in the increasingly crowded closed-loop CPU cooler market segment. Until recently, the company had been largely content to add to its already distinguished family of air coolers. No sense in changing a good thing, right? Then, seemingly out of nowhere, closed-loop liquid-coolers started coming out of the woodwork. We had an instant arms race on our hands. And nothing makes an arms race more interesting than when a new superpower emerges. Enter Zalman to the battlefield.

We've already introduced you to a portion of Zalman's arsenal. The CNPS20LQ fired the first shot (see the August 2012 issue for our full review), and now Zalman's followed up with a trio of new weapons: the LQ310, LQ315, and LQ320. We covered the LQ315 in the November 2012 issue. This month, we're taking a look at the big gun.

The LQ320 is a 120mm radiator, but describing it as such does it a disservice. The LQ320's radiator measures 52mm thick, which makes it one of the thickest—if not the thickest—radiators we've ever tested. This gives it considerable cooling capacity. The LQ320 includes a 120mm PWM fan, and like the rest of Zalman's closed-loop coolers, you can (and should) add a second fan to the radiator and create an efficient push-pull fan configuration.

The cooler's all-copper waterblock has a neat trick up its sleeve. Rather than being completely flat surface, the base of the waterblock consists of a vast array of micro fins, which increases the base's surface area to quickly send CPU heat packing. With the combination of the LQ320's super-thick radiator and copper micro fins, you have a CPU cooler that works smarter, not harder.



The top of the LQ320's waterblock/pump unit has a blue LED that gives it some visual punch without being gaudy. The radiator's brushed aluminum housing looks good, too. All in all, the fit and finish is exactly what you'd expect from a company that knows how to make a good-looking cooler.

Once we unboxed the LQ320, setup and installation was an effortless affair. Attaching the retention clip, securing the waterblock/pump unit to the CPU, and mounting the radiator took less than five minutes. Because we used an LGA2011 board, we were able to forgo installing the back plate, but adding this step for other processor sockets barely moves the time or difficulty meter, even if you have no experience with closed-loop coolers.

We chose Intel's mighty Core i7-3960X to push the LQ320 to its limits. We installed the six-core monster in Intel's flagship DX79SR and prepared our benchmarks to deliver a punishing CPU load. First, we let the Core i7-3960X idle,

and the LQ320 held our average core temp at a steady 31 degrees Celsius. Next, we looped POV-Ray 3.7 Beta three times, and the LQ320 maintained a 59 C average. The story was the same for Prime95's Small FFT test: Again, the LQ320 kept the mercury at 59 C. These are very good thermals, and our results suggest that the LQ320 will give you a lot of thermal headroom to push for an aggressive overclock regardless of your CPU.

When you pair the LQ320's impressive performance with its polished designed, you have a closed-loop liquid-cooler that's tough to beat. Whether you're building a new high-end system or simply looking to upgrade your CPU cooler, the LQ320 needs to be on your short list. ■

BY VINCE COGLEY

LQ320
\$109.99
Zalman
www.zalman.com

Specs: Materials: Copper (waterblock), aluminum (radiator), Socket compatibility: Intel 1155/1156/1366/2011, AMD AM2/2+/3/3+, AMD FM1/FM2; Fans: 1 120mm PWM (900 to 2,000rpm); Radiator dimensions: 52 x 124 x 153mm (HxWxD)

Test system specs: Processor: Intel Core i7-3960X; Motherboard: Intel DX79SR; GPU: EVGA GeForce GTX 680 Classified 4GB; RAM: 16GB Corsair

Dominator Platinum DDR-2133; Storage: Intel SSD 520 Series 240GB; Windows 8 Pro



Zalman Z5 Plus

The Z5 Plus from Zalman is a mid-tower case that, among other things, can handle up to five 120mm fans, and graphics cards up to nearly 13 inches in length. You can even control the speed of all those fans via a High/Low switch on the top of the chassis when it's time to optimize for quiet running or extra cooling.

Zalman designed the Z5 Plus in all black, and even though there's a mix of plastic and steel on the exterior, the black finish is surprisingly uniform. Both the front and top of the chassis feature vented openings that allow the interior fans to draw air in and push it out of the case. The side panel is built of clear acrylic to let you see inside the case, where you will quickly notice the same black finish as the exterior,

resulting in a cohesive overall look and feel. The Z5 Plus comes with three 120mm fans (two with blue LEDs): one in front of the hard drive cage, one beneath the top panel, and one on the inside of the chassis' rear panel. Spaces for the optional fans are provided in the top and bottom panels, should you feel the need for more.

The interior of the Z5 Plus also features a number of thoughtful touches that make it convenient to work with, such as rounded steel edges so you don't have to worry about getting cut on sharp steel. A 3-in-1 bracket is included to let you install a 3.5-inch or 2.5-inch device into the optical drive bay. An SSD can also be installed into the bottom of the hard drive cage, thanks to the screw holes in the case bottom.

A generous motherboard tray cutout lets you attach a CPU cooler with the motherboard already installed in the case, and mesh grates behind the vented openings in the front and at the bottom of the chassis make it easy to remove dust buildup.

This is a smartly designed case; its slim, mid-tower size gives you some location flexibility with your system, as it could fit under or inside a computer desk. We also like that it provides plenty of room and cooling for performance builds. ■

BY NATHAN LAKE

Zalman Z5 Plus
\$59.99
www.zalman.com

Specs: Dimensions: 18.1 x 8.1 x 19.3 inches (HxWxD); Motherboard support: ATX, mATX; Bays: 3 5.25-inch external, 3 3.5-inch internal, 2 2.5-inch internal; Fans (included): 3 120mm (front, rear, and top); Fans (optional): 2 120mm (top and bottom); Expansion slots: 7; Top Panel: 1 USB 3.0, 2 USB 2.0, audio I/O

Fractal Design Node 304

Fractal Design is known for making cases that may not be as flashy as other alternatives, but are no less stylish. If anything, the company proves that simplicity in design can sometimes be a refreshing departure from louder, attention-grabbing cases. Instead, Fractal Design focuses on getting the internal features right and then balances that internal structure with a Scandinavian design sense that really speaks for itself. The Node 304 is no different and it's definitely a compact case that HTPC users, gaming enthusiasts, and mass storage lovers should pay attention to.

The Node 304 features a simple rectangular design, sporting a subtly curved front panel with a brushed metal texture. It's easy to imagine it as part of a high-end home theater system, placed comfortably next to a surround sound receiver and Blu-ray player. It's ideal for other uses, too; Fractal Design recommends it for housing a storage server or a gaming PC. And after taking a look under the stylish exterior, we can see why.

One thing we really like about the Node 304 is how you can remove the top panel, which gives you access to the inside of the case from the top as well as both sides. It makes installing components a breeze because you don't have to contort your hands to get into tight spaces. Everything is immediately visible and designed for quick access. The first thing you'll notice is the striking contrast of three white hard drive mounting brackets, which are screwed into the internal frame just below the top panel. Each bracket can hold two hard drives (for a total of six), but the great thing about these brackets is that they're removable. So, if you use higher-capacity hard drives and only need one bracket, you can remove the other two to make way for a larger graphics card (up to 12.5 inches



long) or to free up space for easier, more efficient cooling.

To aid in cooling the internal components, Fractal Design includes three ultra-quiet Silent Series R2 fans with the case, including one 140mm rear panel exhaust fan and two 92mm intake fans under the front panel. All are connected to the three-step fan controller on the rear of the case for getting the air circulation just right. Additionally, the Node 304 supports CPU coolers of up to 165mm, and has a total of three removable, rinsable air filters.

Fractal Design designed the Node 304 to support ATX PSUs up to 6.29 inches deep, but notes that you may need to opt for a smaller PSU, depending on how many drive brackets you use and the

length of your graphics card. As such, we recommend planning your config in advance and factoring in the size of these components before you start ordering your parts to prevent any potential conflicts.

With the Node 304, Fractal Design has taken its unique, simple design sense and applied it to a compact case that still has enough space to build a powerful rig. If you're looking for something simple, stylish, and functional, you can't do much better than the Node 304. ■

BY JOSH COMPTON

Node 304

\$89.99

Fractal Design

www.fractal-design.com

Specs: Dimensions: 8.2 x 9.8 x 14.7 inches (HxWxD); Motherboard support: Mini ITX, DTX; Bays: 6 internal 2.5/3.5-inch SDD/HDD; Fans (included): 2 front 92mm, 1 rear 140mm; Ports: 2 USB 3.0 (with included 3.0 to 2.0 adapter), audio I/O

Aerocool Mechatron Black Edition

Aerocool's Mechatron case may remind us of a certain leader of the Decepticons (and nearly shares his name), but make no mistake—there is nothing deceptive about this midtower. The Mechatron's steel-black exterior, sleek design, and builder-friendly features make the case appear exactly as it should: a cooler than cool case perfect for any enthusiast with an eye for style.

The mean-looking Mechatron combines 0.6mm SECC Japanese steel with black plastic accents that give it a slightly jagged aesthetic. The front of the case is mostly perforated, metal mesh, and the aforementioned plastic pieces give it a futuristic, almost robotic appearance. The left side panel also sports metal mesh, which provides additional ventilation and lets internal LED lighting shine through and add even more personality to the Mechatron's already intriguing design. (Aerocool recommends red LED fans, and we can't disagree with that suggestion) And speaking of fans, the Mechatron supports up to eight, depending on your configuration, and also has pre-drilled holes ready for watercooling tubing. If you opt for an air cooler for your CPU, the Mechatron allows clearance for coolers up to 6.89 inches tall.

Aside from style and cooling, the Mechatron also has multiple features that builders should love. The motherboard tray boasts four rubber-grommeted holes for cable management. For a midtower case, there is quite a bit of room inside, which means you can install the components you need and take advantage of the space between the motherboard tray and the right side panel to keep cables out of sight and out of mind. The Mechatron also makes it easy to swap out storage drives with its pinch-and-pull bays.

The Mechatron has ample room for high-end hardware. It accepts graphics cards up to 12.99 inches long. Along



with the three 5.25-inch and three 2.5-inch drive bays, there are four 2.5/3.5-inch bays. Plus, the Mechatron features antivibration pads for both the hard drives and the PSU to help prevent damage and reduce noise. The PSU bay has a magnetic, removable, and washable filter, as well.

Perhaps the best thing about the Mechatron is that it gives equal attention to both form and function. Those who want to show off can add some more LED lights to the mix and let them

really shine through. For those who just want a solid midtower case with plenty of room for components, it's a fit as well. And for those seeking a healthy mix of both, you can't go wrong with the Mechatron Black Edition. ■

BY JOSH COMPTON

Mechatron Black Edition

\$119.99

Aerocool

www.aerocool.us

Specs: Dimensions: 19.8 x 8.9 x 21 inches (HxWxD); Motherboard support: ATX, mATX; Bays: 3 5.25-inch external, 3 2.5-inch internal, 4 2.5/3.5-inch internal; Fans (included): 1 200mm front, 1 120mm rear; Fans (optional): 1 180/200mm or 2 120/140mm top, 1 200mm or 2 120/140mm side, 1 120/140mm bottom; Front panel: 2 USB 3.0, audio I/O



SilentNight-500
\$159.99
Rosewill
www.rosewill.com

Rosewill SilentNight-500

The SilentNight-500 from Rosewill is more than your typical quiet power supply. In fact, there's no fan at all in this PSU. Instead, Rosewill connects several heatsinks to the heat-generating components inside the SilentNight-500, and those heatsinks transfer heat to a large aluminum heatsink located on the top of the unit. As such, when you install the SilentNight-500 in your case and fire it up, it should be, well, silent. The SilentNight-500 also meets the 80 PLUS Platinum certification with a maximum efficiency of 92%, so it'll help save you money in the long run.

The SilentNight-500 has a semi-modular design. The hardwired cables consist of the following: one 20+4-pin main power, one 4+4-pin EPS12V, and one PCI-E cable with two 6+2-pin connectors. The hardwired cables are sleeved with a rounded mesh, while the modular cables are flat, for easy routing. For modular options, you'll find a second PCI-E cable with two 6+2-pin connectors, as well as three cables that offer a combined six SATA connectors, five Molex connectors, and one FDD connector. All in all, you'll have enough connectors for most

midrange builds, including SLI and CrossFire setups.

The SilentNight-500 features a single +12V rail that's engineered to supply 41.5A (498W peak). The +5V and +3.3 rails can deliver 20A each for a peak output of 100 watts. Built-in protections are provided against overvoltage, overpower, undervoltage, and short circuits. Rosewill covers the SilentNight-500 with a five-year warranty that includes both parts and labor.

To test the SilentNight-500, we ran simultaneously ran POV-Ray Bera 3.7 (stresses all CPU cores) and Aliens vs. Predator (stresses GPU, all settings maxed at 2,560 x 1,600). The key hardware in our benchmark system included an Intel Core i7-3770K, a GIGABYTE GA-Z77X-UP7 motherboard, and a ZOTAC GeForce GTX 580. Under load, we saw a maximum wattage of 420W and a power factor of .975.

The key feature of the Rosewill SilentNight-500 is its fanless design, which makes the unit ideal for builders focused on quiet computing, especially HTPC enthusiasts who demand that their systems keep a low acoustic profile. Support for multiple graphics cards also

makes the SilentNight-500 a smart option for midrange performance builds. ■

BY NATHAN LAKE

Specs	Rosewill SilentNight-500
Rated continuous (W)	500
12V Rails	1
+12V max (A)	41.5
+5V max (A)	20
+3.3V max (A)	20
SLI/CrossFire-ready	Yes
Max wattage tested	420
Power factor tested	.975
Efficiency rating (as advertised)	Up to 92%
PCI-E	4 6+2-pin
Main 12V	20+4-pin
8-pin EPS	1 4+4-pin
SATA	6
4-pin Molex	5
Floppy	1
Length (including cable band)	7.6 inches
Warranty	5 years
Test system specs: Processor: Intel Core i7-3770K; Motherboard: GIGABYTE Z77X-UP7; GPU: ZOTAC GeForce GTX 580; RAM: 16GB Kingston HyperX Predator DDR3 1866; Storage: 128GB Crucial RealSSD C300; OS: Windows 7 Enterprise (64-bit)	

Enermax Ostrog GT

At 19.5 x 9.6 x 19.1 inches (HxWxD), the Ostrog GT isn't the biggest case in Enermax's lineup, but that doesn't mean it skimps on features. There's plenty to like about this impressive midtower. In fact, the Ostrog GT can support multiple fan and drive configurations, so you can customize it to your heart's content, and it's loaded with features power users have come to expect from an enthusiast case.

The overall design of the Ostrog GT is simple, but Enermax has added some cool flourishes. For instance, the right side panel is your typical matte black metal, but the left side panel has a clear acrylic panel so you can show off the internal components you've worked so hard to get just right. It also has an interesting design on the front, with a mix of perforated black and blue metal mesh as well as molded plastic accents. Our Ostrog GT's two 140mm front panel fans lit up the scene with blue LEDs. The case also comes in a red model with a red metal border and red LED fan lights; a blue alternative with all-black metal and blue LED lights; and a black and white model with a white metal/mesh border and white LED fan lights.

In addition to the two front fans, the Ostrog GT also includes one 120mm rear fan and space for up to seven additional fans. If liquid-cooling is more your speed, it supports a radiator of up to 240/280mm. Needless to say, you have plenty ways to customize the cooling system.

In terms of internal working space, the Ostrog GT doesn't disappoint. There's 1.26 inches of space between the motherboard tray and right side panel for cable management purposes. The drive trays come in a separate box, so you can place them in the cages however you like and come up with your own configuration of 2.5-inch and

3.5-inch SSDs and HDDs. The locking mechanisms on the 5.25-inch drive bays are strong, so you won't have to worry about drives moving around. And if there just isn't quite enough space inside for you, the middle HDD cage actually slips out pretty easily.

With Ecomaster's Ostrog GT, the key word is customization. You choose your fan configuration, hard drive layout,

and even how much open space there is inside the case. Plus, you get it all for a relatively low price. ■

BY JOSH COMPTON



Ostrog GT

\$79.99

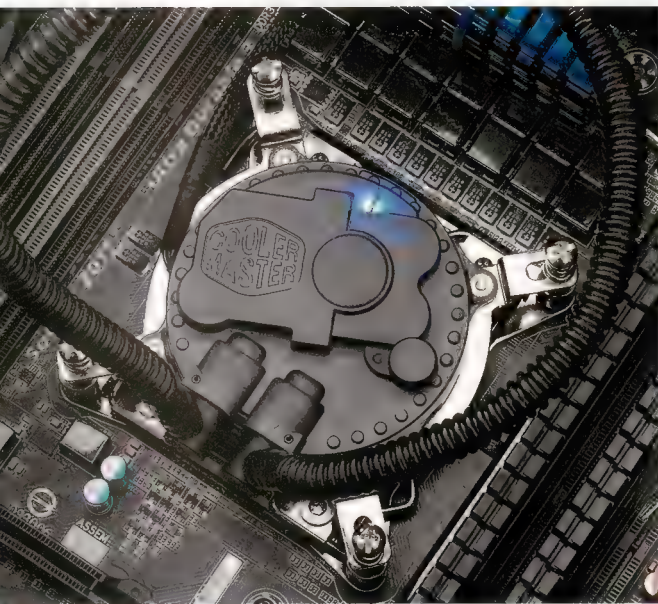
Enermax

www.ecomastertek.com

Specs: Dimensions: 19.5 x 9.6 x 19.1 inches (HxWxD); Motherboard support: ATX, mATX; Bays: 3 5.25-inch external, 8 3.5-inch internal, 2 2.5-inch internal; Fans (included): 2 140mm blue LED front, 1 120mm rear; Fans (optional): 1 200/230mm or 2 120/140mm top, 4 120mm HDD cage, 1 120mm bottom; Front panel: 2 USB 3.0, 2 USB 2.0, 1 LED controller, audio I/O

Cooler Master Seidon 120M

Silent Liquidity



Cooling with convenience. That's a laudable goal.

Many a power user has longed for the quiet efficacy of liquid CPU cooling—and all the overclocking headroom that comes along with it—only to be daunted by one or more factors: a long list of watercooling parts, the complexity of a traditional liquid-cooling setup, or the hassle of periodic system maintenance. And then, of course, there's the more

obvious worry over what can happen to their expensive hardware should something spring a leak.

Cooler Master (www.coolermaster-usa.com) and other manufacturers address all of these issues with convenient, high-quality solutions. One such is the Seidon 120M, intended for the mainstream do-it-yourselfers of the PC world. So named as a play

on Poseidon, the Greek god of the sea, the Seidon is a sealed, closed-loop, liquid cooler that's as easy to install as a traditional heatsink/fan combo.

"Many don't know it, but Cooler Master introduced the first AIO (all-in-one) liquid cooler in 2005, the AQUAGATE Mini R80," says Nicholas Amoroso of Cooler Master's desktop team.

"Our goal with the Seidon was to bring an in-house-designed and -created solution that would be affordable for all and still offer that balance of price and performance that people have come to expect from us. We also focused on product that would be maintenance- and issue-free for years to come."

On The Block

The part of the Seidon 120M that absorbs heat from your CPU is a water block with a pure copper baseplate. Although many competitors make use of blocks that are manufactured by OEMs, Amoroso says, Cooler Master designed and built the Seidon's entirely in-house. The smooth base of the plate contacts the metal heat spreader on top of the processor through a thin layer of thermal compound.

On the other side of the baseplate (the side in contact with the Seidon 120M's liquid coolant) Cooler Master milled a number of integral fins called microchannels. These have the effect of increasing the surface area of the water block's copper baseplate. This increases the amount of heat that can be transferred to the coolant as it travels along the micro channels, reducing the CPU's temperature accordingly. And

because the company machines the baseplate out of a solid block of copper, there are no junctures between the plate and its micro channels to hamper the conduction of waste heat.

The top of the water block is an attractive, translucent polymer cover. It's ringed by 12 bolts made of stainless steel, which secure it to the copper baseplate with a watertight seal. Cooler Master pressure-tests the circuit to make sure that there are no leaks.

The company includes a bracket kit with the Seidon 120M that makes the water block compatible with the sockets of all recent Intel and AMD processors, including the high-performance ones of interest to power users, overclockers, and gamers.

Pump It Up

Nestled under the water block cover is the Seidon 120M's pump. It's a low-noise model (17dBA). In fact, it's so quiet that Cooler Master gave it a blue LED indicator to let you know when it's operating. And no worries about longevity: The Seidon 120M's spec list claims that the pump should last nearly twice as long (70,000 hours) as the fan (40,000 hours).

On the other end of the circuit is the Seidon 120M's aluminum radiator.



Cooler Master used its long experience to engineer this with fins designed for maximum airflow. A 120mm PWM fan, which can be nearly as quiet as the pump (19 to 40dBA), forces air through the radiator to carry heat away.

The radiator and fan assembly is made to fit in a 120mm fan mount in a desktop case. For installation flexibility,

you can bolt it either inside or outside the case.

Liquid vs. Air

No doubt you're aware that there are some very effective air coolers on the market. A traditional heatsink and fan combo—especially a tower-style cooler with heatpipes and a big fan—provides an



effective, cost-efficient way to chill even an overclocked chip. So why buy an all-in-one liquid cooler instead?

"We feel that it's less about choosing one over the other and more a matter of preference," says Amoroso. "This is especially true with the considerably favorable pricing on both sides of the two arenas.

"On the more practical side of things, AIO liquid coolers represent a real opportunity to free up space around the CPU socket that would otherwise be taken up by a large heatsink," Amoroso says. "One could argue that this is good for overall system airflow, unrestricted use of memory sticks with gargantuan heatsinks, and possibly a cleaner look" inside the case. ■



Hassle-Free Liquid Cooling

A factory-filled, all-in-one liquid cooler such as the Cooler Master Seidon 120M is a very different animal from a traditional, build-it-yourself watercooling kit. There's nothing to assemble, save the processor socket mounting brackets and perhaps the radiator and fan assembly.

"You get some of the cool factor of watercooling without the hassle that DIY kits represent," says Nicholas Amoroso at Cooler Master. "To top it off, the performance isn't anything to scoff at."

No mess. You won't get your hands wet—or anything else, for that matter—with a closed-loop liquid cooler. It comes as a sealed system with a long-life coolant fluid already inside.

In contrast, with a DIY system, you'll be cutting and connecting your own water hoses, and it will be on you to ensure that none of the resulting junctions leak. You'll add your own cooling fluid to the system, too. In fact, if you plan to use water as a coolant, you'll also need to mix it with a suitable additive to prevent corrosion and algae growth. On the plus side, a build-your-own watercooling setup lets you add additional water blocks for your video card(s) and motherboard chipset, if you like.

Fewer parts. The Seidon 120M comes as a single assembly, although you can think of it as two subassemblies connected by a pair of flexible hoses. One subassembly is the water block, which has the pump built in. The other is the fan and radiator unit. Connect the block to the CPU socket, attach the fan to a mount inside or outside your PC chassis, and you're done.

A traditional watercooling setup requires you to find room in your PC case for one or two more components, both of which may be a little bulky. One is the pump. The other component

is the reservoir, which is a small tank with a cap that lets you add coolant to the system. The Seidon 120M gets away with not having a reservoir because it requires neither draining nor refilling. Some reservoirs fit in an optical drive bay; others take a little ingenuity when you're looking for a place to mount them.

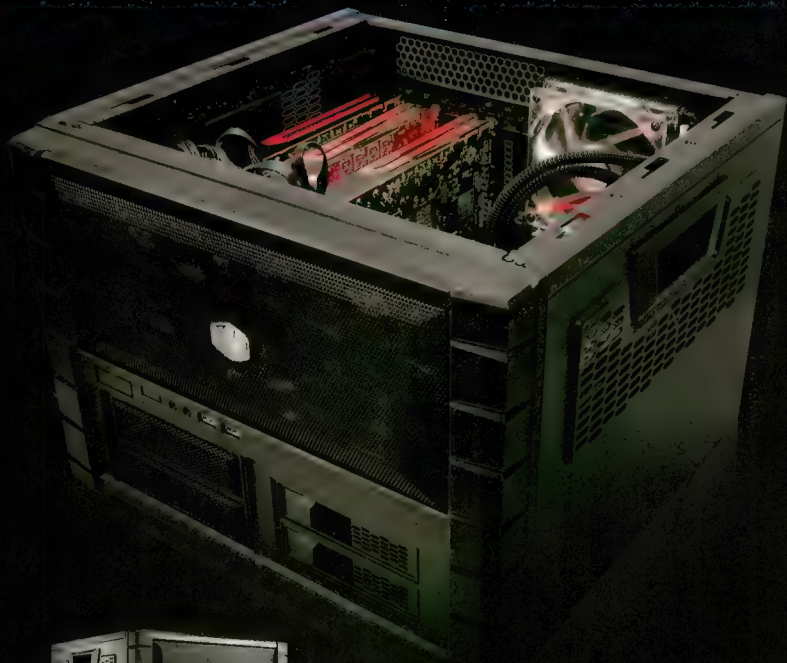
There are exceptions: Certain DIY systems place the pump in the reservoir; others use an external reservoir and pump unit meant to sit outside your computer case. The upshot, however, is the fact that all-in-one coolers such as the Seidon 120M are unobtrusive and simple to install.

Cooler Master Seidon 120M Specifications

Fan Noise Level	19 to 40dBA
Fan Size	120mm
Fan Speed	600 to 2,400rpm $\pm 10\%$
Fan Flow	19 to 86cfm $\pm 10\%$
Fan Life, Expected	40,000 hours
Pump Noise Level	17dBA
Pump Life, Expected	70,000 hours
Radiator Size	5.9 x 4.6 x 1.1 inches
Compatibility	Intel LGA 2011/1366/1156/ 1155/775 AMD Socket FM1/AM3+/ AM3/AM2 AMD FM1, AM3, AM3+, and AM2
Warranty	2 years

HAF XB

THE LAN BOX, EVOLVED.



www.coolermaster-usa.com



Peripherals: Trigger

Deliver an endless hail of destruction with the ability to press up to 6 keys simultaneously and utilize five programmable macro keys with profile management, scripting, and button reassignment.



Cooling: Seidon 120M

The Seidon 120M is Cooler Master's latest incredibly compact watercooling kit that aims to bring watercooling to the masses.

amazon.com

COMPUSA.com

[frys](http://frys.com)

[Canada Computers](http://CanadaComputers.com)

[Memory Express](http://MemoryExpress.com)

[GIGABYTE](http://GIGABYTE.com)

NCL.com

[Newegg](http://Newegg.com)

TigerDirect.com



Scandinavian Design



Node 304



Define R4



Old Acquaintances, But Not Forgotten

2012'S MAD READER MOD WINNERS

New years often begin with hope for the future and thoughts of friendships past. In the spirit of Auld Lang Syne, here's one more look at the Mad Reader Mods that graced our pages last year.



JANUARY 2012

Frank N. Stein by Richard "The1stCav" Schafer

We started the year off right with a monster of a machine named Frank N. Stein. Frank featured a red/black color scheme that melded incredible attention to detail (individually sleeved, hand-sewn cables; painstaking interior refinishing; custom-painted PSU) with a trio of overclocked EVGA GeForce GTX 580s in 3-way SLI, 12GB of triple-channel Corsair Dominator GT DDR3, two RAID5s made up of OCZ Vertex 3 and Vertex 2 SSDs, and an external watercooling system.



FEBRUARY 2012

Shiny by Bill "Mnpctech" Owen

This "cool" mod (shiny is slang for cool in the sci-fi series the mod is based on) combined a weathered, aged look with futuristic tech finishes in the sort of new/old juxtaposition that is familiar to "Firefly" fans specifically and sci-fi fans in general. Shiny sported the nicks, dings, and occasional rust spot of a well-used piece of equipment, and special fan ducts, stickers, and paint finishes hiked the illusion. GIGABYTE's GA-X58A-OC motherboard and an Intel Core i7-920 drove Shiny, as well as 24GB of Corsair Dominator memory, an EVGA GeForce 660 Ti, and Corsair's TX850 PSU.



MARCH 2012

NWWare Exquisite by Larry Anderson

Exotic African woods and stained glass gave NWWare Exquisite its unique look. The side panel of ornate stained glass closed with a flush-mounted magnet, providing tool-less access to the interior, and Anderson created custom mounts for the Corsair Professional Series Gold AX1200 PSU and his drives. Originally outfitted with an EVGA X58 FTW3 mainboard and Intel i7-950, the system was later upgraded to newer components, moving to GIGABYTE's G1.Assassin 2 X70, an Intel i7-3960X CPU, 16GB of Patriot Viper Xtreme Division 4 DDR3, and two 120GB Patriot Wildfire SSDs in RAID 0.



APRIL 2012

AzTec by Dan "dmcgrath" McGrath

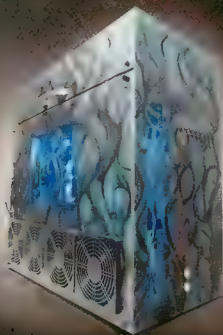
Resembling an ancient temple, AzTec took McGrath more than 250 hours to painstakingly craft, using balsa foam to carve structures and figures that he attached to a Thermaltake Level 10GT. Hobby shop foam moss and simulated vines helped give AzTec the look of a monument rising out of the jungle, along with some leaves McGrath fashioned out of Super Sculpey modeling clay. The overall look was anchored by coats of 3M Rotted Wood Stabilizer. AzTec's look alone was enough to get it featured in CPU, as the case was shipped out to be featured at CES without any internal components.



MAY 2012

EpiDemic by Jon "Pennywise" Hansz

An electrician by trade, Hansz went "old school" on the wiring for EpiDemic, putting more than 60 hours into extending, resleeving, lacing, and rerouting the wiring and cables inside of this mod. Other handcrafted items included a special graphics card support, custom acrylic feet, and a light controller with internal and external controls. Powered by Intel's Core i7-2700K CPU on an EVGA Z68 FTW mobo, the system sported 16GB of Mushkin Enhanced Redline 2,133MHz memory, EVGA's GeForce GTX 580 Classified Hyrdro Copper 3072MB graphics card, two 120GB Corsair Force Series GT SSDs, and a Corsair Professional Series Gold AX1200 PSU.



JUNE 2012

Station 6 by Geoff Groves

Groves built Station 6 from the ground up using aluminum sheets that he cut with a jigsaw, Dremel, and power drill in his garage. He then applied the custom paint job himself after — get this — learning how to use an airbrush by watching YouTube videos. This one-of-a-kind case held an Intel Core i7-920 that Groves overclocked to 4.2GHz on an MSI Big Bang Xpower motherboard, 12GB of G.Skill PI Series DDR3-1600, an XFX Radeon HD 7970, a Thermaltake Toughpower 700W PSU, four Corsair 60GB Force Series SSDs, and three 300GB Western Digital Raptor hard drives.



JULY 2012

Uber Cube by Nick "Getim" Stefanski

Also known as Uber³, this mod represented six months of work from start to finish. Stefanski rerouted all the wiring from the system's dual 500W Corsair PSUs so that it came out the back of the units. He stripped, sleeved, and repositioned more than 300 feet of wire. One of the PSUs powered the mobo and the other handled the cooling system and graphics cards, yet the entire system ran from one power cord and a single power button. Components included an Intel i7-2600K, ASUS Maximus IV Extreme mainboard, 16GB of Corsair DDR3-1333 memory, ASUS Matrix GTX 580 Platinum video card, and 4TB of mass storage.



AUGUST 2012

42-174 by Mike "ikem" Henry

This rig, named after a fire truck and built by a third-generation firefighter, used a color scheme that played off the familiar flaming red found on most fire department vehicles, complete with flashing red and blue lights on the DIMMs. Special latches on the side and front panels continue the theme, along with an authentic fire department patch on the front and fire hose-like yellow heat shrink on the watercooling tubing. AMD's Phenom II X6 1090T CPU on an ASUS Crosshair V Formula AM3+ mobo drove this unit. Other components included 8GB of Crucial Ballistix Tracer 1600MHz memory, two 1GB Radeon HD 6870s in CrossFire, a 64GB Crucial M4 SSD, and Seasonic X750 Gold PSU. The base case was a Lian Li PC-7F.



SEPTEMBER 2012

Plum Crazy Trooper by Otis "ReckNBall" Fatz

Otis Fatz reoriented the position of the motherboard in the Cooler Master CM Storm Trooper case for this mod. He also hand-built the entire front of the case, modified the top panel, and cut two custom windows on each side to show off the interior. All-white case fans accentuated the amazing custom purple paint job. An Intel Core i5 CPU, GIGABYTE's Z68X-UD3H-B3 mobo, an EVGA 560 Ti video card, 8GB of Corsair DDR3-1600 memory, and Cooler Master's Silent Pro Gold 800W PSU with black and purple sleeving for the cables rounded out the system.



OCTOBER 2012

ENERMAX Fulmo Type-R by Bob "BS MODS" Stewart

Bob Stewart says this mod was inspired by Honda's Type-R Mugen Civic; we say Stewart did a great job of capturing the car's essence. For starters, he disassembled the ENERMAX Fulmo base case and changed the color from black to white. He then stripped out the drive cage, added a mirror window, cut custom acrylic panels to hide the optical bay area, and painted the ENERMAX Platimax 1200W PSU. Meters and a front-panel touchscreen provided an instrumental look, along with LED light strips complete with remote control. Components included Intel's Core i7-980X, ASUS' Rampage III Extreme mobo, 24GB of Patriot Viper memory, two SAPPHIRE FLeX HD 6870 graphics cards, a Patriot Wildfire 120GB SSD, and an ENERMAX ETD-T60-TB CPU cooler.



NOVEMBER 2012

Mad Black by Larry "1MadGrunt" Timmons, Jr.

The all-black acrylic build with white accents, Mad Black had flame faceplates, a skull logo, interior sleeving, and other highlights. Timmons even replaced the Blu-ray drive's blue LED with a white one. For components, Mad Black sported an Intel Core i7-2600K OC'ed to 5.2GHz, an ASUS P67 FTW mobo, 8GB of G.SKILL SNIPER DDR3-1866 memory, a Kingwin L2P-1000 PSU, two NVIDIA GeForce GTX 570 Superclocked video cards, Creative's X-Fi Titanium HD Sound card, and two 120GB Corsair Force Series GT SSDs in RAID 0.



DECEMBER 2012

Project BIO-A10 by Jeremy "E.E.L. Ambliense" Birch

Weathering is a tough effect to simulate convincingly on a mod, but this system really showed its "age." Birch used a variety of techniques to get the worn look that he wanted, including applying up to 10 layers of a solution of copper sulfate and iron to get a rust effect. Brownish-red primer followed by a mix of black and camouflage brown spray-paint provided the base color, while numerous sessions with high-grit sandpaper, foam sanding block, and steel wool helped age the mod. Birch also reworked the entire interior of the Lian Li PC-A10 case to install a triple-140mm radiator along the bottom panel. He also modded the PSU and wiring, installed a cooling system, and put paint blotches on the interior to simulate a bio-contagion leak.

Modding Masters

Before The First Cut

Every month, *CPUs* "Mad Reader Mod" feature showcases an unbelievable, jaw-dropping custom mod that redefines what we thought was possible with the right tools in the hands of an inspired, creative, and determined modder. These are the systems that turn heads and win prizes at LAN parties, and the modders behind them are the rock stars of the PC enthusiast scene. Many of these modders are commissioned to create custom mods for the biggest companies in the business, but a lot of them got their start with little more than an idea and a clunker case in need of a visual refresh.

What if you're just beginning your modding career? "Mad Reader Mod" shows you the end result, but if you've ever followed a worklog online you know the insane amount of work that goes into these stunning creations. And although worklogs help explain much of the magic behind the mods, wouldn't it be great to have a sit-down chat with the sages of modding, who have collectively amassed thousands upon thousands of hours of experience?

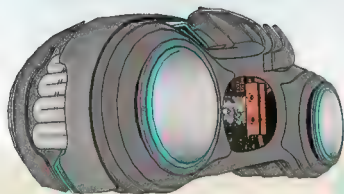
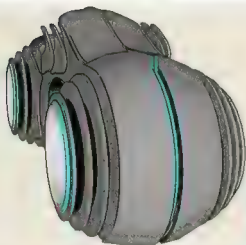
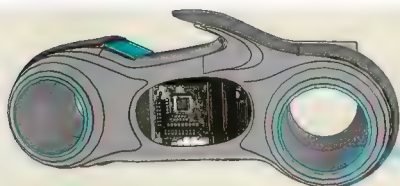
"Modding Masters" provides you with up-close and personal access to the pillars of the modding community. We've called on previous "Mad Reader Mod" winners as well as modders who have taken first-place honors at our LAN party case mod contests to provide their expert opinions on all things mod. It's the closest you're going to get to these rotary tool ninjas and paint booth Picassos short of online videoconferencing or criminal trespass. Listen to their wisdom, learn from their mistakes, and follow their advice, and perhaps the coveted "Mad Reader Mod" spread will one day belong to you.

This month, we talked to Craig "Tech Daddy" Tate, Lee "pcjunkie209" Harrington, and Brian "Boddaker" Carter on the topic of prep work. Sometimes, the difference between smashing success and abject failure comes down to making the most of the planning stage. The old saw "measure twice, cut once" rings true in the world of case modding, too.

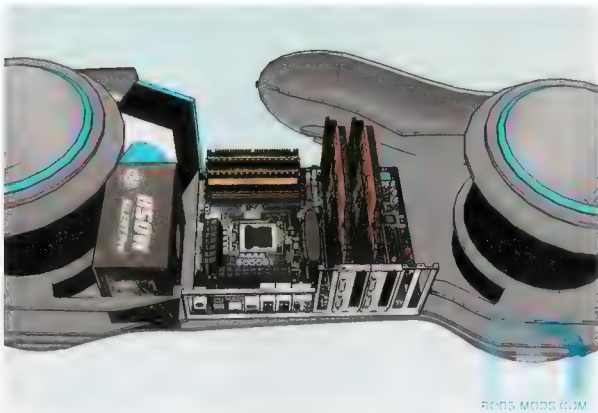
Rookie Mistakes

The first foul a beginning modder makes when starting a mod without a plan is starting a mod without a plan.

"The biggest mistake you can make is starting right in on a mod before planning it out," Carter says. "You may start out



Brian "Boddaker" Carter didn't just watch "TRON" a few times, head to his workbench, and start cutting when he built his TRON Lightcycle PC mod. First, he fired up his 3D modelling software and put the mod together virtually.



A cutaway of the TRON Lightcycle PC mod reveals how Carter mocked up his build with the components he wanted to include.

fine, but halfway into the build you'll end up having to redo parts, and that will cost you time and money. You'll save yourself many headaches if you sit down and think it through before you remove that first screw."

Tate says problems can arise for modding newbies even before the planning stage. He says that modders undertaking their first mod would be wise to set realistic objectives based on their initial skill set.

"If you are just starting out, you have to remember that you don't have that knowledge set," Tate says. "You have to learn it. Setting the bar too high, or too advanced, can be detrimental. If you make your first mod too technical, you may become frustrated with the results [upon completion], or give up on it because your abilities cannot keep up with your vision, what I call mid-mod meltdown."

Tate recommends a tiered approach for 99% of all modders undertaking their first mod, adding that only an extremely small number of people are able to build a "pro" mod on their first shot. He says that by going big out of the gate, many aspiring modders end up going home. "Set reasonable goals

and achievements. Become more aggressive in your builds as you become more familiar with the tools and tricks to making mods look how they do. You want to build on your successes [rather than] get frustrated because you don't understand how to do some sort of advanced technique."

Harrington agrees, offering the following advice: "Sometimes it may be better to start small, like a window mod, and see how that comes out, because then you will have a better feel for how to cut and what may be comfortable for you. It depends on the resources that you have available to you."

"I would definitely recommend starting small to learn the basics first," Carter says.

"Practice on a couple scrap pieces of whatever material you want to use to get familiar with it. That way you're not learning on your good pieces, and you hopefully won't have to redo the part numerous times."

Shop Smart

Part of any good modder's game plan absolutely needs to take into account the desired components for a given build. After all, cutting a sweet motherboard tray out of plexi is all for naught if you botch the dimensions and make it incompatible with the motherboard you ordered.

"I usually build my mods around the motherboard and try to showcase the hardware," Harrington says, "so my most important thing to consider in a new mod is the hardware I'm going to use (mostly the case and the motherboard)."

"Do your homework on your parts before you starting ordering stuff for your mod. A little research can save hundreds of dollars."

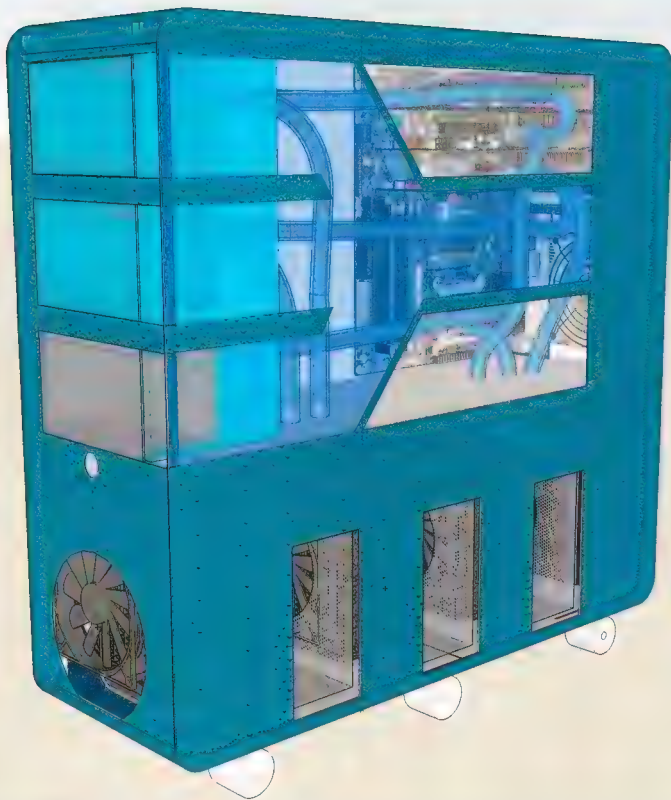
Soft Tools

One of the more contentious topics among this month's panel of master modders was the issue of using modeling software to produce a schematic(s) of your planned mod. Although all three acknowledge the benefits of modeling software, only Carter actively plans his mod with the aid of these apps.

"I use [Trimble] SketchUp quite a bit when designing my builds because it's easy, fast, and free," he says. "Plus, you can find tons of computer parts already modeled in the SketchUp Components Collection (scc.jezmckean.com/home) that will make your pre-vis come together even faster." Carter adds that he also uses

- BRIAN CARTER

Neptune's Trident, another Brian "Boddaker" Carter original, began its life in SketchUp.



Adobe Photoshop for quick composites, using existing case photos in addition to images scoured from the web.

Tate agrees. "I really need to learn SketchUp. It is your best pre-visualization friend when it comes to accurately building your mod. Many components are already built as 3D models, so that sizing will be to scale in your mod."

Although Harrington says he owns 3D modeling software, he still takes a

decidedly low-tech approach to creating blueprints for his mods.

"I have ViaCAD Pro but never learned how to use it," he says. "Someday I will, and then I can stop drawing on napkins!"

Always Expect The Unexpected

Despite Tate, Harrington, and Carter's agreement that it's a good idea to have a plan in place before beginning your first mod, all three say there are as many

unforeseen complications that can crop up during a mod as there are modders. Knowing that and incorporating it into your modding strategy can be crucial when things don't go according to plan.

"There are some builders that can plan out how their build is going to go, and they plan to the nth degree," Tate says. "Still, you simply don't know everything about your build until you get into it and start building. When I build . . .

I try to leave some space around all of my components, which leaves space for alternative thinking and positioning, should I suddenly be faced with a need to shift stuff and make adjustments."

"It depends on the concept and how complex it is," Carter says. "Some ideas are really simple and don't require too much detail, and I can usually carry through to completion without any embellishments. Other times, I know a concept has room to grow, so I just go ahead and get started after a basic layout and just let more ideas manifest during construction. Then I just adjust my workflow to implement them into the build."

"For my UAL 737 case mod, I ran into a situation where I needed to make the acrylic fuselage shell but didn't have the means to do it. So I set out to build my own vacuum forming table. That was definitely something I hadn't planned on doing when I originally had the idea for the case."

Harrington knows what it's like to adapt his plan when circumstances change; he's had to do it on his current mod. "I am having that issue now on a mod I am doing for Cooler Master," he says. "I am waiting on the watercooling parts to show up so I can pre-lay the build out and start my cutting. I have a habit of changing my plans part way through the mod because it may look better, so yes, I try to leave room for adjustments, but sometimes there's no room for error."

The Final Word

Carter reminds modders not to emphasize a mod's form at the expense of its function.

"When I'm designing a custom mod, I always make sure I have enough room for all the components," he says. I also try to retain as much functionality from the stock case as I can, and if possible,

add more. Having a great-looking themed case is nice, but if it still serves its purpose and is more useful than before, then the project is a success."

Says Tate, "A cohesive vision is the most important thing for me. The vision gives me a feeling and an inspiration about the mod, and that will allow for me to work through unexpected issues while staying with the same thought process and engineer a solution that will fit."

Harrington recommends that new modders turn to the community if you hit a snag at any point in the process. "Ask questions on forums and other social sites," he says, "because most modders will share their knowledge to help you out. In the end, if you plan your mod out and do your homework, things will go a lot smoother."

Start your plans now, because "Modding Masters" will be back next month, with new masters and more advice. ■



Craig "Tech Daddy" Tate's Raptor mod is a great example of how planning can help avoid potential pitfalls before they're inescapable. "I did the mod for my daughter," Tate says, "who wanted something to do with dinosaurs. I immediately started thinking about a dig site and dinosaur fossils. Initially I was thinking about building/embedding bones into the case (exposed rib cage, teeth, etc.) but quickly shelved that when I realized that this case was going to be on the floor near her very active feet. So the design and concept changed to durability and potential future repair if needed. The concept moved to a fossil dig site, using 'casts' instead of bones. This is a fairly simple case mod, but it shows the need to have a cohesive vision and preplanning in order to think out potential build issues."



PC MODDER
MAD READER MOD

Iron Man Case Mod

IRON MAN

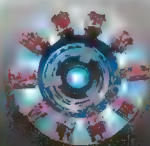
EDW L. CHRISTIANSON works in graphic arts and says he's always enjoyed painting, sculpting, and model building. His passion and experience are both evident in his Iron Man Case Mod, which Christianson says took about 300 hours to complete.

ALBERTO AT ARRA
PC MODDER
MAD READER MOD



"I don't outsource any of my work and I molded all my pieces for the mod by hand," he says. "I could have spent another hundred hours on this mod if I'd had the extra time." (Thermaltake took Iron Man to Taipei this summer for Computex.) "I'm pretty pleased with the end result, but I want to add more gears and develop his under armor a bit more."

Christianson began with Thermaltake's Armor Revo Gene Snow Edition, dismantling and stripping the chassis down to the bare metal inside and out before repainting and reassembling it with custom copper rivets from Mnpctech. He built a working Arc Reactor—and by that we assume he means it lights up, not that it actually generates enough energy to power a supersonic flying metal



PC MODDER
MAD READER MOD



suit—into the side panel's 120mm fan hole and created a custom backlit window graphic simulating Iron Man's internal HUD.

The right side panel got a Captain America shield graphic on the inside, Christianson says, "There were references to Captain America in both Iron Man movies, and I wanted to add my own reference in the mod, as well."

He mounted missile turrets on the outside of both side panels, and the right side panel got a tactical countermeasure flare emitter opposite of where the Arc Reactor mounts to the left side. To complete the effect, Christianson designed the paint job to include what looks like battle damage.

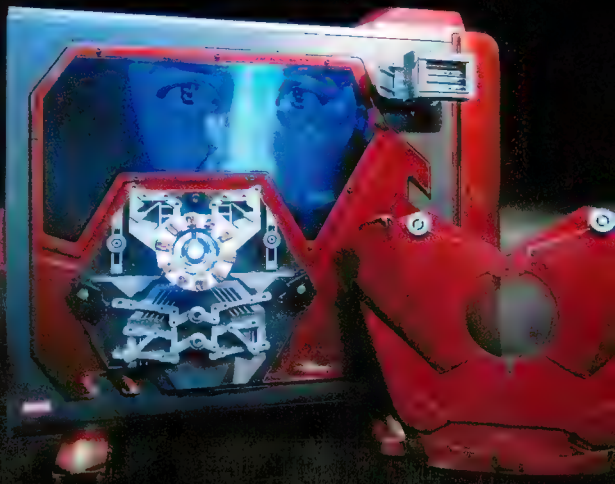
"I believe that passion, dedication, and inspiration are the best tools of any modder's workbench," Christianson says, and we will not presume to argue with the man.

The only thing that we like more than this mod right now was the news that Christianson shared about his upcoming mods. In addition to a very cool Biohazard/Resident Evil scratch build, which you can see more of at www.youtube.com/ronleec1, and a Cooler Master case that he's modding to look like a Ducati, Christianson says that he plans on doing "several of the Avenger mods like the Iron Man Case Mod."

We call dibs on the Hulk mod. ■

GIVE US YOUR MOD

Have a computer mod that's blown a tear in our eyes? Email photos and a description to madreadermad@cpumag.com. If we include your system in our "Mad Reader Mod" section, we'll send you \$1,500 and a one-year subscription to *GPU*.





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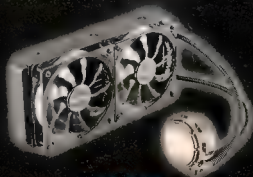
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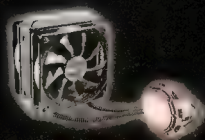
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GIGABYTE GA-Z77X-UP7

A High-Powered Motherboard

The GA-Z77X-UP7 from GIGABYTE is all about power. *Of course it is*, you say; what else would we write in a publication for power users?

Only we're not speaking generically. The GA-Z77X-UP7 motherboard, quite literally, is about delivering very high doses of stable power to your CPU. As a result, your processor can be all it can be when you're overclocking it, without being held back by an unsteady or overheating power stage. It's no coincidence that this board has at least one world record under its belt.

Power Up

GIGABYTE bases this very interesting mainboard on the Intel Z77 Express chipset. Amidships is a LGA1155 processor socket for chips such as Intel's 22nm "Ivy Bridge" 3rd Generation Core CPUs, especially those with "K" part number suffixes (unlocked multipliers). The GA-Z77X-UP7 has an E-ATX form factor, so you'll need to be sure to install it in a chassis built to handle its extra length.

Most remarkable about this big board is its all-digital power delivery with a very high capacity for electrical current. International Rectifier supplies its IR3550 PowIRstage ICs, which combine the functions of a number of traditional "D-Pak" power chips. Specifically, a single IR3550 chip replaces four old-school MOSFETs in each power stage, including two low-sides, one high-side, and a driver IC.

Besides saving space on the motherboard, the IR3550 chips



supply more precise CPU power for stable overclocking. Moreover, they increase power efficiency up to a 95% peak rating during normal operation. That helps them run up to 30 degrees Celsius cooler than the 3-pin MOSFETs they replace, GIGABYTE says. This considerable thermal difference gives the GA-Z77X-UP7 even greater OC potential, while at the same time lowering case temperatures by a significant margin.

This All Digital Engine works with other power components selected as part of GIGABYTE's Ultra Durable 5 technology. For example, the high-capacity ferrite core chokes on the motherboard, like its IR3550 controllers, are rated at a startling 60A each. Nearby, solid capacitors do their part with expected reliability.

Underneath it all, among multiple planes of a new glass fabric, are twin power layers made of copper. Thick (70µm), as you would expect in a premium mainboard, the two copper power layers ably conduct heat away from sensitive parts while shouldering the board's power load.

And what a power load. With its 32+3+2 phase power (32 phases for the CPU, three for the processor's on-die graphics, and two for voltage termination), the GA-Z77X-UP7 can deliver up to 2,000W of power—more than the outlet you plug it into, in other words. Granted, you'll ever need that much power capacity, but it does ensure stable, smooth power at the levels you'll require for overclocking in the real world. (As an aside, GIGABYTE points out that 2,000W is enough to

The GA-Z77X-UP5 TH Brings The Thunder

GIGABYTE's GA-Z77X-UP5 TH leaves out some visual flair and a few other items to come in at a substantially lower price than the GA-Z77X-UP7, but it does pack a surprise that its big brother doesn't have.

First, let's compare the two boards. The GA-Z77X-UP5 TH is slightly smaller, being a standard ATX model instead of an E-ATX board. Lacking a PLX chip, its SLI/CrossFireX opportunities are limited to a still-potent, 2-way PCI-E 3.0 x8 setup. It doesn't have a PS/2-style keyboard/mouse port, but it does come with a legacy PCI slot and a 6Gbps eSATA port on the rear I/O panel.

The big surprise, and the standout feature that puts the "TH" in the GA-Z77X-UP5 TH's name, is its pair of rear Thunderbolt ports. Each port gives you up to 10Gbps of bidirectional, theoretical bandwidth—that is to say, 5Gbps input and 5Gbps output simultaneously (somewhat less in reality).

Together, the GA-Z77X-UP5 TH's Thunderbolt ports support a couple of extra 2,560 x 1,600 monitors with mini DisplayPort jacks, and/or several fast external storage devices. Like old SCSI devices, you can daisy-chain

one Thunderbolt device to another. Tweak the BIOS to reallocate a few resources—you'll lose the use of the Marvell SATA ports, specifically—and each port will be able to support up to six Thunderbolt devices. Lightning may or may not strike twice, but apparently thunder does. ■



Specifications

Compatibility	Intel LGA1155 3rd & 2nd Generation	Intel LGA1155 3rd & 2nd Generation
Core processors	Core processors	Core processors
Chips	Intel Z77 Express, PLX PEX 8747	Intel Z77 Express
Max memory	32GB (DDR3-1600; DDR3-2400 OC)	32GB (DDR3-1600; DDR3-2400 OC)
Slots	3 PCI-E 3.0 x16, 2 PCI-E x8 (x16 physical), 2 PCI-E 2.0 x1	1 PCI-E 3.0 x16, 1 PCI-E x8 (x16 physical), 1 PCI-E x4 (x16 physical), 3 PCI-E 2.0 (x1), 1 PCI
SLI/CrossFireX	Up to 4-way PCI-E 3.0 x8	2-way PCI-E 3.0 x8
Storage	6 SATA 6Gbps, 4 SATA 3Gbps, 1 mSATA	3 SATA 6Gbps, 4 SATA 3Gbps, 1 mSATA
Rear I/O	1 VGA, 1 DVI-D, 1 HDMI 1.4, 1 DisplayPort, 6 USB 3.0 ports, PS/2 keyboard/mouse	1 VGA, 1 DVI-D, 1 HDMI 1.4, 1 6Gbps eSATA, 4 USB 3.0, 2 USB 2.0 ports, 2 Thunderbolt
Wireless adapter	Bluetooth 4.0, 900Mbps dual-band 802.11a/b/g/n dual antennas	Bluetooth 4.0, 300Mbps dual-band 802.11a/b/g/n dual antennas
Audio	Realtek ALC898 codec, 119dB 8-ch. HD audio, optical digital out	Realtek ALC898 codec, 110dB 8-ch. HD audio, optical digital out
LAN	2 Gigabit Ethernet	1 Gigabit Ethernet
Form factor	E-ATX	ATX

run approximately 25 Intel Core i7 3770K processors—the same model of chip used to set a new world record of 7.102GHz on a GA-Z77X-UP7 board.)

Overclocking

GIGABYTE's 3D Power utility comes with the GA-Z77X-UP7 board to make overclocking in Windows an easy affair. 3D Power lets you tweak voltage, phase, and frequency in real time through a graphical interface.

The Voltage section of 3D Power gives you command over Turbo Voltage Response, which digitally supports the CPU and RAM with quicker changes from one voltage level to another, such as when a heavy processing load comes online. Turbo Voltage Response is not just the overclocker's friend, GIGABYTE says; it's also better for power conservation when the system demand isn't so high. 3D Power's Voltage area also includes Load Line Calibration and OverVoltage Protection settings.

In the Phase category of 3D Power, you'll be in charge of CPU Phase Control, which could help you eke out additional horsepower in an overclock scenario. Safety measures OverCurrent Protection and PWM (pulse-width modulation) Thermal Protection are also found in the Phase section.

Finally, 3D Power's Frequency panel provides settings in the sections of CPU PWM Frequency, VTT (voltage termination) PWM Frequency, GFX (graphics) PWM Frequency, and DDR-A/B (memory) PWM Frequency.

If you're feeling more hands-on, you can use the board's OC Touch buttons to overclock your processor. A pair of onboard buttons raise and lower the CPU ratio; another set will increase and decrease the BCLK. The OC Gear button—which isn't so cryptically labeled if you think of it as a low gear/high gear shifter—sets the increments of the BCLK +/- buttons to either a granular 0.1MHz or a rough 1MHz. There's also a main power button and a clear CMOS button, plus a wide array of voltage measurement points.

Close by is the cleverly named LN2 Mode switch. It's primarily for extreme



overclockers, such as those intrepid souls pouring liquid nitrogen out of insulated mugs. Flip the LN2 switch during the brief but critical moments of a very chilly overclock, and the GA-Z77X-UP7 will drop the CPU multiplier to 16X to keep benchmarking software such as CPU-Z from crashing and spoiling the moment.

3D BIOS

You can also overclock the GA-Z77X-UP7 the old-fashioned way using its BIOS, or rather UEFI. Of course, the UEFI is also the place to adjust more mundane settings, such as system fan speeds, and to disable ports and headers you don't plan to use.

In that vein, you may be pleased to hear about GIGABYTE's 3D BIOS. 3D BIOS is a GUI mode that makes it easier to find what you're looking for in the UEFI.

As you look at a 3D representation of the GA-Z77X-UP7, you can use your mouse to select a part of the board you'd like to adjust. Want to change your CPU

frequency? Click the processor socket on the onscreen motherboard, and the appropriate BIOS settings panel will appear. Click the SATA ports, and you'll raise a relevant context menu.

3D BIOS' settings panels are clickable and, where appropriate, scrollable. In our book, standardized mouse control almost always beats hunting for the +/-, PAGE UP/DOWN, and other buttons according to some BIOS's arbitrary key bindings. That said, you can switch to the Advanced mode if you prefer to comb through BIOS/UEFI settings with a Tab-and-type interface.

GIGABYTE outfits the GA-Z77X-UP7 with its Dual UEFI BIOS, meaning that you'll have a physically redundant BIOS chip at your service. You can choose the way you want to use the second BIOS, too. For instance, you can set it to be a backup in case you get into trouble with a flash update. Alternatively, you can set one BIOS to OCed settings and the other to normal, power-saving specs, and then use a toggle switch on the motherboard to select which BIOS to boot.



Acceleration

The GA-Z77X-UP7 may be ideal for the overclocker, but it's also a great board for the content creator and/or multi-GPU gamer. With the help of a PEX 8747 switching chip from PLX, this Z77-based mainboard has enough PCI-E lanes to support up to 4-way SLI/CrossFireX at PCI-E 3.0 x8 speeds.

On the other hand, there are times when it would be better to have the simplicity of a single graphics card, such as when you're focusing your OCing efforts on the CPU. Hence, GIGABYTE places an extra x16 slot on the board that has a direct link to the processor. By bypassing the PLX chip, this black PCI-E slot gives your single-card system the benefits of lower latency.

The back panel of the GA-Z77X-UP7 sports HDMI, DVI, and DisplayPort video outputs tied into the onboard graphics of whichever Intel Core processor you install. Elsewhere on the board is Virtu GPU virtualization technology from Lucid, which can dynamically switch between the CPU's on-die graphics

and your power-hungry video card(s) as needed. Virtu MVP also includes a HyperFormance feature to optimize the speed of the graphics pipeline.

There's one other acceleration technology in store: an mSATA connector. This onboard connector supports small, plug-in SSDs that can give your system a solid-state performance boost in conjunction with Intel Smart Response and Intel Rapid Start technologies. A module using mSATA mounts directly to the motherboard, so you won't have to bolt it into a drive bay or attach it elsewhere. And because it uses SATA—despite its mini PCI-E physical connector—an mSATA drive won't take any PCI-E lanes away from your other devices.

Wireless

A nice extra in the GA-Z77X-UP7's retail box is a GIGABYTE GC-WB300D

adapter card. This wireless wonder connects your system to your mobile devices as well as to your WLAN. With Bluetooth 4.0 onboard, you can use your compatible phone or tablet as a remote for your PC, for instance.

The other part of the GC-WB300D card gives you 300Mbps, dual-band Wi-Fi. The 802.11a/b/g/n can use both the 5GHz and 2.4GHz bands, so

you'll always be able to access the fastest connection in your location. Even better, the adapter comes with two remote antennas that are cabled, so you can place them for the best reception.

To help you use all this wireless power, GIGABYTE provides a variety of software and mobile apps. You'll be able to stream media files, tap into network folders, share your PC's Internet connection with your other devices, and more. ■





CPU SYSTEM WORKSHOP

RIG IN THE NEW YEAR



A new year calls for a new build from the CPU System Workshop. While average Joes and Janes are hitting the gym or swearing off junk food, we're making a resolution to assemble nothing but insanely powerful systems. When other schlubs are toiling over a treadmill, we'll be toiling over our workbench. When the calorie counters are fretting over whether to wolf down that second Twix, we'll be fretting over the perfect overclock, right down to the tenth of a volt. It's fair to say that we think 2013 is going to be a big year.

Now, we're pretty sure that a lot of you said good bye to 2012 with guns blazing in *Black Ops II* or scheduling the pain train to make a stop in *League of Legends*, so what better way to recognize all of the excellent LAN parties of last year by putting together a gaming PC that will dominate the LAN parties of this year? We wanted the best components money can buy for our New Year Annihilator. If you're like we are, good enough is never good enough. That's why we're targeted companies' top-shelf parts for this build.

The Times Square Ball has dropped. The last of the hot wings are gone, and we've wiped the incriminating party photos from our SD card. The only thing left to do is roll up our sleeves and get to work. Something tells us we'll have no problem following through on our New Year's resolution.

Gear Up

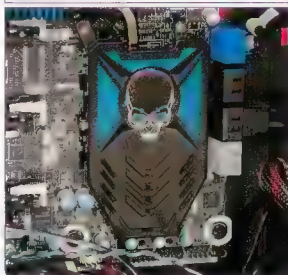
Our hunt for parts for this build began with the CPU. A year after its debut, Intel's Core i7-3960X is still as wicked as ever. To recap, this CPU comes is clocked at 3.3GHz (3.9GHz Turbo) and



comes equipped with six cores, 15MB of Intel Smart Cache, and an integrated memory controller gives you access to quad-channel memory configurations. Naturally, the Core i7-3960X comes with an unlocked multiplier, and we know from ample experience that we can expect good things from this chip when we begin our overclocking endeavors.

Last year, Intel's DX79SI was top dog, but now the DX79SR ups the ante. Everything we liked about the DX79SI is back for another round on the DX79SR, plus the addition of a pair of 6Gbps SATA ports and two more USB 3.0 ports on the rear I/O panel. There are diagnostic LEDs that supply real-time feedback about the CPU, memory, video, and power components. The motherboard's three PCI-E 3.0 x16 slots are designed with gamers in mind, as the top two slots will operate at their full x16 speed in a dual-graphics card setup. If you add a third card, its PEG slot runs at a very respectable x8. The DX79SR's eight DIMM slots mean business, too; you can install up to 64GB of DDR3-2400, and Sandy Bridge-E's memory controller will run it in a quad-channel configuration.

Speaking of quad-channel memory, we turned to Corsair for our gaming system's DDR3, and the memory maker didn't disappoint. This build features a kit of Dominator Platinum memory, or four sticks of 4GB DDR3-2133. That'll definitely get the job done in today's top games. With timings of 9-11-10-30, this is a great all-around kit, as well. We know that we can't be gaming all the time, so it's good to have a reliable, high-performance memory kit like this to help us make short work of our other computing chores.



Only Kepler would do for our gaming Goliath, specifically NVIDIA's current single-GPU king, the GeForce GTX 680. With a baker's dozen of GTX 680s in its stable, EVGA knows a thing or two about graphics cards based on NVIDIA's fully enabled GK104 GPU. We zeroed in on the EVGA GeForce GTX 680 Classified (part number 04G-P4-3688-KR), which boasts a core and boost clocks of 1,111MHz and 1,176MHz (up from the reference GTX 680's 1,006MHz/1,058MHz core/boost clocks), respectively. This graphics card also

boasts a whopping 4GB frame buffer, so we went ahead and cranked the visual effects on our games and let this nasty graphics card do its thing.

For our last primary component, the SSD, we tapped the 240GB variant of Intel's SSD 520 Series as our system drive. The SSD 520 is based on LSI SandForce's now legendary SF-2281 controller. (Seriously, the SF-2200 family of SSD controllers has been around for almost two years, and they're still terrific performers.) Where other SSD manufacturers frequently



rely on third-party NAND, Intel's is homegrown: The SSD 520 Series relies on a complement of compute-quality Intel 25nm MLC NAND. The result is expectedly brilliant performance. When fed a sequential workload, the 240GB SSD 520 can produce maximum reads of 550MBps, while writes can top 520MBps. Random IOPS are top-notch, too—50,000IOPS random reads and 80,000IOPS random writes out of the box. With 240GB capacity, our system has plenty of room for both Windows and a healthy number of games, all of which will load lightning-fast.

Intel's Core i7-3960X is a 130W processor, which calls for a little extra muscle in the CPU cooling department to fully unleash its power, especially since we were looking to overclock the new CPU. Enter Zalman's LQ320, the latest in the company's rapidly growing family of closed-loop liquid-coolers. The LQ320 is equal parts flashy and ferocious. A blue LED built into the pump/waterblock unit supplies a little visual flair, and a radiator that measures 52 meaty millimeters thick eradicates heat. Zalman machined micro fins into the LQ320's pure copper waterblock, further increasing the cooler's ability to quickly absorb and dissipate heat from the CPU. One fan is included, and you can mount an additional fan to the LQ320's radiator to raise your thermal ceiling to the stratosphere.

Such powerful components are naturally a little power-hungry, but keeping them sated is easy work for ENERMAX's beastly Platimax 1350W (model EPM1350EW1). This is Enermax's flagship, and it shows. There's a six-pack of 12V rails (each rated at 30A) at your disposal, and the PSU's eight 6+2-pin PCI-E cables make it possible to

install and power a truly terrifying graphics subsystem. In our case, it means that we can expand our system down the road without swapping out the PSU. And as an 80 PLUS Platinum-certified PSU, the Platimax 1350W is one of the most efficient power supplies in the history of power supplies.

Finally, we needed a place to put all this sweet loot. For that, we picked a case maker with years of experience and an impressive portfolio of enthusiast cases: Thermaltake. We opted for the Armor Revo, a full tower that remembers its roots. This chassis bears a few flourishes you'll undoubtedly remember from Thermaltake's earlier Armor cases, but it's updated its repertoire, so to speak. The Armor Revo includes a pair of 200mm fans (one front, one side) and a 140mm rear fan, so it's equipped for serious cooling right out of the box. Other excellent touches include a surprisingly useful built-in headset hook, cable

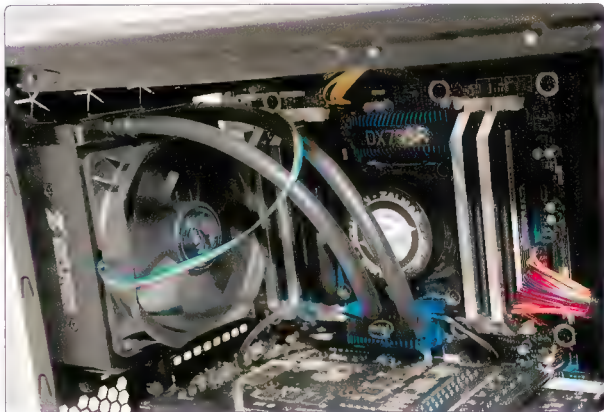
management holes right where we need them, and top panel buttons to control fan speed and case lighting. In short, it's a great match for our hardware.

Ready To Annihilate 2013

If 2013 is anything like 2012, this year is going to be loaded with videogames we'll be itching to play. With the components we've chosen for the New Year Annihilator, we have no doubt that our first CPU System Workshop build out of the gate in 2013 will be more than capable of running all the AAA titles now and well into the future.

The following pages feature in-depth coverage of select components, and then we'll wrap things up with an after-party of sorts. We sent our newly christened system through our gauntlet of benchmarks. Stock and overclocked results are provided for your viewing pleasure.

It's going to be a good year. Let's get started. ■





THERMALTAKE

Armor Revo

Enthusiasts are likely to be familiar with Thermaltake's Armor lineup, as it was introduced back in 2005 and has been popular among gamers in the intervening years. The Armor Revo has been revamped to include modern features and innovative design changes that will enhance your build.

Clean & Cool

With the Armor Revo, Thermaltake provides you with three 200mm fans (front, top, and side; the front and top fans are equipped with blue LEDs), which have been prewired to the case's fan controller located on the front chassis. This convenient control makes it easy to manually reduce fan noise or increase the fan speed to improve cooling. The Armor Revo also offers a 140mm rear exhaust fan. Thermaltake has gone to great lengths to ensure routing cables in the Armor Revo will be a pleasant experience. There are rubber grommets and space behind the motherboard tray to route your power and data cables, and the case's side panel has a built in power circuit, so you won't have any loose wires to power the side fan.

Performance Features

The front end of the top panel provides two USB 3.0 ports, two USB 2.0 ports, an eSATA port, and audio inputs. There's also an HDD hot-swap dock to let you easily transfer files from backup drives. Along the front of the case, you'll find four external 5.25-inch drive bays, one of which converts to a 3.5-inch bay. There are six internal

SPECS

23.1 x 10 x 21.7-inches (HxWxD). Motherboard support: ATX, mATX; Bays: four 5.25-inch external, six 3.5/2.5-inch internal; Fans (included): 1 200mm LED front, 1 200mm LED top, 1 200mm side, 1 140mm rear; Fans (optional): 2 120mm front, 2 120/140mm top, 1 120mm rear, 1 120mm bottom; Expansion slots: 8; Front panel: 2 USB 3.0, 2 USB 2.0, 1 eSATA, audio I/O.

3.5-inch bays, and each of the HDD trays offers screw holes for 2.5-inch drives—ideal for SSDs. All bays also feature a tool-free design. Eight expansion slots are available, and the Armor Revo can support graphics cards up to 12.9 inches long.

Imposing Design

Thermaltake retained the front wings from the original Armor, which feature a sturdy brushed metal look. A window in the left side panel gives you the ability to peek at the system's interior hardware, and the lighting from the blue LEDs in the top and front chassis fans help to illuminate

the interior. Wide feet on the front and rear of the case ensure a stable stance while creating space beneath the case for plenty of room for air to move through the ventilation grille beneath the power supply mount. The vent also features a removable, rinsable dust filter.

Excellent gaming PC cases tend to share a few common attributes, including ample airflow, plenty of internal space for multiple graphics cards, and a visual "wow" factor. The Armor Revo more than covers all these bases and offers much more. As such, it was the clear choice for our gaming build. ■





INTEL

Core i7-3960X

Due to some timing issues, we couldn't quite manage to get Intel's latest and greatest high-performance CPU, the Core i7-3970X, for this build. (We'd say the odds are better than average that we'll have one for a future PC project, though, so stay tuned.)

In the meantime, we secured the next-best thing—a chip that still obliterates everything else on the market. We're referring, of course, to Intel's Core i7-3960X Extreme Edition, a six-core monster built on a 32nm process and ready to take on any workload you put in front of it.

The Core i7-3960X works with Intel's X79 chipset, which the chipmaker released to eager power users near the end of 2011, and which is still the platform of choice for folks who value high-octane performance over all other considerations.

So what makes the Core i7-3960X so special? Let's start with its memory controller, because it's pretty extraordinary. The Core i7-3960X has a quad-channel memory controller. This is one step up from the triple-channel controller that many of Intel's earlier high-end Core i7s, but "one step up" barely does this advancement justice. When Intel pitted the Core i7-3960X against the Core i7-990X and Core i7-2600K in SiSoft Sandra 2011b, the Core i7-3960X smoked them both, delivering 102% and 114% improvements in memory performance, respectively. Running four sticks of DDR3-1600, the Core i7-3960X is capable of an insane maximum

SPECS

Socket: Intel LGA2011; Clock speed: 3.36GHz (3.9GHz Max Turbo); 15MB Intel Smart Cache; Hyper-Threading; TDP: 130W; 32nm process



theoretical bandwidth of 51.2GBps. Then consider that we paired it with a 2,133MHz kit for this build, and you start to get an idea of what makes the New Year Annihilator so special.

If you want more proof, check out the chip's whopping 15MB of Smart Cache, which is 25% more than the Core i7-990X offered, and that helps the Core i7-3960X handily beat its predecessor in tasks such as video editing, 3D rendering, and ray tracing (as well as pretty much everything else). The Core i7-3960X's PCI-E 3.0 is ready to take full advantage of the latest and greatest

graphics cards, and you get 40 lanes to work with.

By now, you well know that Intel CPUs branded with an "X" have unlocked multipliers to encourage overclocking. In our Core i7-3960X review (see page 25 in January 2012 issue), we pushed our very first 3960X up to a generous 4.6GHz with relative ease while using an off-the-shelf closed-loop liquid-cooling unit. So although we generated The New Year Annihilator's numbers at stock clocks, with a bit of a tweak we are confident that you will have this chip screaming, not to mention dominating every other CPU on the planet, save one. ■

ZALMAN

LQ320

Although we ran the New Year Annihilator's benchmarks at stock clocks, Intel's Core i7-3960X is more than game when it comes to overclocking. And Zalman's LQ320 provides us with more than enough cooling headroom to produce a high-performance overclock. The LQ320 is Zalman's flagship liquid CPU cooler model, and it's rated to handle up to 340 watts of Qmax heat current, so it'll cool the processor under very hot temperatures. We also like that the LQ320's radiator is the thickest (52mm) in the Zalman lineup, which provides more surface area to cool the liquid in the closed loop.

One Cool Kit

The LQ320 comes with one 120mm, PWM fan that can operate from 900rpm to 2,000rpm. The PWM speed allows the LQ320 produce a minimal amount of noise in idle, while still delivering high-performance cooling under heavy loads. Zalman also includes the screws necessary to install a second fan to increase the cooling capability of the LQ320, and you likely could easily connect the LQ320 to the existing rear exhaust fan inside your case. The LQ320 also features an attractive design, as the water block features a bright blue LED and the exterior of the radiator offers a black hairline finish.

Convenience

Compared to a large heatsink and fan combo, the LQ320's slim water block

will take up hardly any space on your motherboard, so you won't need to worry about the height of the memory modules you select for your build. You'll also enjoy the universal compatibility with Intel and AMD motherboards, as Zalman provides support for Intel LGA 1155/1156/1366/2011 and AMD FM2/FM1/AM3+/AM3/AM2+/AM2 sockets. We found the LQ320 easy to install; all we had to do was attach the necessary pieces to the Intel bracket, place it on the waterblock, and mount the waterblock to the backplate. Once installed, no other maintenance is required, because you won't have to replace the coolant—thanks



SPECS

Water Block: Copper; Pump: 12V;
Fans: one 120mm fan that can
operate from 900 to 2,000rpm;
Radiator: Aluminum

to the glycol-based liquid, which includes a corrosion inhibitor.

In the LQ320, Zalman has given us the increased performance potential needed to produce a high-performance, stable overclock. The LQ320's universal compatibility also means that you can import it into your system without a hitch. ■


INTEL

DX79SR

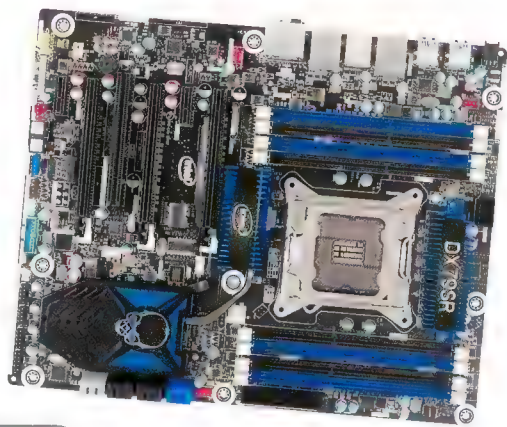
Opting for Intel's X79 chipset was a no-brainer for our high-end gaming system, as it allows us to harness the six-core, 12-thread processing power of Intel's Core i7-3960X. We recently checked out Intel's DX79SR in the December issue and came away impressed with its support for performance overlocks, multiple GPUS, and 64GB of memory.

CPU & Memory Overclocking

Located within the BIOS setup, you'll find Intel's Overclocking Assistant, which provides aggressive presets for CPU and memory overlocks. The utility takes CPU settings into account to ensure everything is stable. The Overclocking Assistant also features a 1.25X Gear Ratio feature that provides access to the BCLK and other frequency controls. A manual mode is available in the Overclocking Assistant to make small changes to the overclocking settings provided by Intel, so we can fine tune for improved performance. In total, you'll find support for 64GB of DDR3 memory that can be clocked up to 2400MHz.

Graphics Possibilities

The DX79SR offers three PCI-E x16 3.0 slots, and the top two provide full x16 speed. If you opt to install a third graphics card, it will run at x8 speed, thanks to the 40 lanes provided by your Intel processor. Both 3-way SLI and CrossFire are supported on the DX79SR.



SPECS

Max memory: 64GB (DDR3-2400), 3 slots, 3 PCI-E x16, 2 PCI-E x1
Storage: 4 SATA 6Gbps, 4 SATA 3Gbps, Rear I/O: 4 USB 3.0, 6 USB 2.0, 1
FireWire, 2 Ethernet, 1 S/PDIF out, audio I/O analog

For other add-in cards, Intel provides two PCI-E x1 slots and a legacy PCI slot.

Connectivity

Intel's got pretty much all of your connectivity concerns covered with the DX79SR. For internal storage, you'll find four 6Gbps SATA and four 3Gbps SATA ports—all of which support RAID 0, 1, 5, and 10. For peripheral connectivity, you'll find support for six USB 3.0 ports (four rear, two internal), 14 USB 2.0 ports (six rear, eight internal), and two

FireWire (one rear, one internal) ports. Intel also provides an add-on module that delivers 802.11b/g/n and Bluetooth 3.0 connectivity, so we didn't need to invest in any extra wireless hardware.

The DX79SR certainly provides us with support for all the high-end equipment in our build, and it will also let us enhance the hardware's value with some speedy overlocks. Add in plenty of connectivity and the Intel DX79SR is pretty much all we could ask for in an X79 motherboard. ■



INTEL

520 Series 240GB

With the top-notch hardware elsewhere in this system, not including an SSD boot drive would have been unthinkable, and we've picked a great one with the 240GB Intel 520 Series. It offers sequential read speeds of up to 550MBps and sequential write speeds of 520MBps.

Flashy Technology

The 520 Series is built with Intel's 25nm MLC NAND flash memory, and Intel has added a controller that's based off of the SandForce SF-2281 for speedy data transfer. To give you an idea of performance, Intel lists that the 520 Series can produce random 4K reads at up to 50,000 IOPS and random 4KB write at up to 80,000 IOPS. We tested the 240GB in the 520 Series for our review in the December issue, and our benchmarks backed up Intel's speed claims.

Data Security & Integrity

For security, the 520 Series offers support for 128-bit encryption via its high-end controller. That means we can secure the data on our drive and prevent hackers from stealing it, if the high-end rig is lost or stolen—a legitimate concern for those that must pack up their system for travel to a LAN party. Intel's end-to-end data protection is also provided to ensure that the files being stored in the SSD will also be accessible.



SPECS

Maximum sequential read/write: 550MBps/520MBps; Maximum random 4K read/write: 50,000IOPS/80,000IOPS; Interface: 6Gbps SATA; Five-year warranty

Solid But Flexible

To make it easy for you to install the drive into your system, Intel provides a 3.5-inch drive bay adapter with each 240GB 520 Series SSD. You'll also enjoy the suite of utilities that can help you transfer and manage your data. For example, Intel's Data Migration Software helps you to replicate the operating system and files on an existing HDD or SSD and move them over to the 520

Series SSD. Intel's SSD Toolbox provides diagnostic tools and an optimizing utility that helps you to take full advantage of the 520 Series' capabilities.

This SSD provides some serious performance benefits, and we like that Intel backs up the 520 Series with data protection features and a five-year warranty. The 240GB Intel 520 Series certainly complements the rest of the hardware in our build. ■

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CPU SYSTEM WORKSHOP

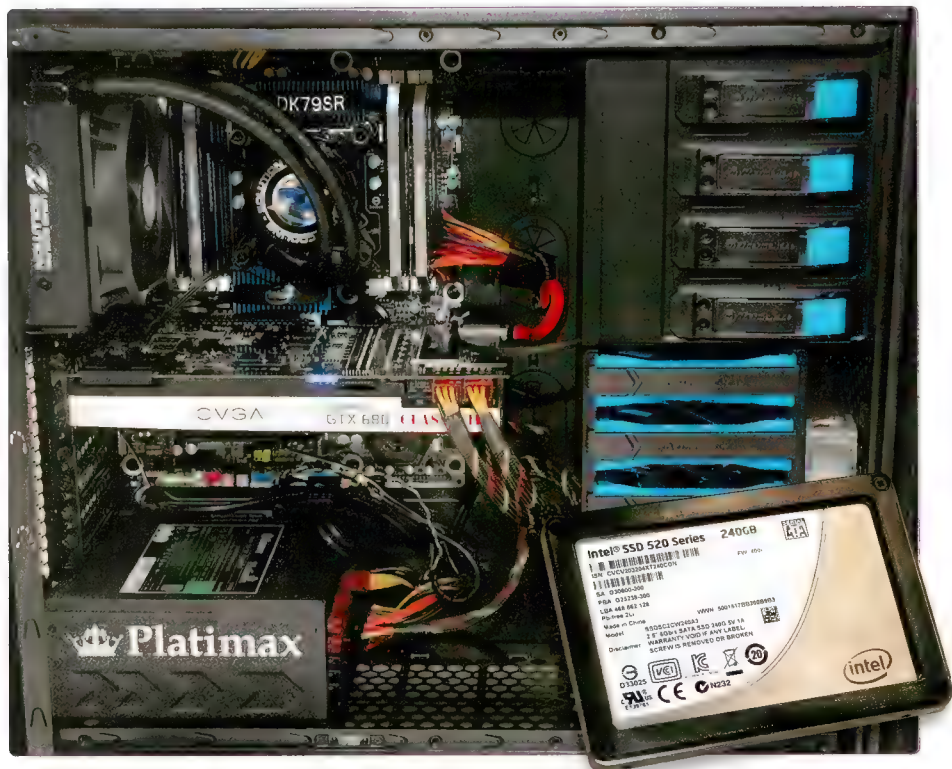
BENCHMARKS, ANNIHILATED



On the preceding pages, you've had a chance to get up close and personal with some of this month's VIPs. Like what you saw? You'll like the performance even more. The New Year's Annihilator has some of the fastest hardware we've ever had in hand, so we wasted no time putting it all together and letting it run wild through

the *CPU System Workshop* test suite (and run wild it did). If you thought New Year's Eve fireworks were impressive, you ain't seen nothin'.

Credit EVGA with equipping the GeForce GTX 680 Classified with an absolutely ridiculous cooler. It's no wonder that the card's core and memory clocks explode out of the gate at 1,111MHz and 2,004MHz, respectively. With this factory overclock, the GTX 680 Classified put up impressive results in our graphics-intensive benchmarks. The overall score of



X3631 in 3DMark 11 is phenomenal for a single GPU, and our scores in Aliens vs. Predator and Metro 2033 are very good, too, considering that we ran the games at 2,560 x 1,600 with the settings jacked. Realistically, you could dial down the quality settings and/or screen resolution, and you'll be gaming in style.

Naturally, with the Core i7-3960X, this build also shined in benchmarks

designed to push a system's CPU. Our scores in Sandra, POV-Ray, and Cinebench were some of the highest we've ever seen. And check out those memory bandwidth results in Sandra. Ridiculous.

As shown in CrystalDiskMark, the Intel SSD 520 gave us the speed we need to launch games and apps quickly. It posted respectable results across the board, and

Windows 8 was extremely responsive installed on the drive.

Games are the New Year Annihilator's forte, but truth be told, this machine tackles every task with ferocity. If the first build of 2013 can put up numbers like this, it's going to be a very, very good year at the CPU System Workshop. Stay tuned as we follow through on our New Year's resolution in future issues this year. ■



SPECS

BENCHMARK RESULTS

Overall (Extreme)	X3631
Graphics Score	3314
Physics Score	12517
Combined Score	3853
Graphics Test 1*	17.65
Graphics Test 2*	17.04
Graphics Test 3*	16.37
Graphics Test 4*	9.96
Physics Test*	39.74
Combined Test*	17.92

3D Benchmarks

Processor Arithmetic	
Dhrystone Native SSE4.2 (GIPS)	229.15
Whetstone Native SSE3 (GFLOPS)	146.74
Processor Multimedia	
Integer Native x16 AVX (Mpixels/s)	354.62
Float Native x16 AVX (Mpixels/s)	447.93
Double Native x8 AVX (Mpixels/s)	264.41
Float/Double Native x8 AVX (Mpixels/s)	327.57
Memory Bandwidth	
Integer B/F AVX/128 (GBps)	50.96
Float B/F AVX/128 (GBps)	50.17

Compute

CPU**	11.22
-------	-------

Per-File I/O

Render All CPUs***	1929.44
--------------------	---------

CrystalDiskMark 3.0.1***

Sequential Read	479.2
Sequential Write	800
512KB read	423
512KB write	291.9
4KB Random Read (QD1)	24.95
4KB Random Write (QD1)	83.66
4KB Random Read (QD32)	234.1
4KB Random Write (QD32)	260.2

3D Mark 11***

Aliens vs. Predator (Very HQ, Shadows High, 4XAA, 16XAF, SSAO On, HW Tess., Adv. Shadows)	33.8
Metro 2033 (DX11, Very High Quality, 4X MSAA, 16XAF, DOF off)	27.68

*Frames per second

**Points

***Pixels per second

****MBps

Test system specs: Processor: Intel Core i7-3960X; Motherboard: Intel DX79SR; Graphics: GeForce GTX 680 Classified 4GB; RAM: 16GB Corsair Dominator Platinum DDR3-2133; Storage: Intel SSD 520 Series 240GB; CPU cooler: Zalman ZM30; PSU: Enermax Platinum 1250W; Case: Thermaltake Armor Rev0; Windows 8 Pro

ZALMAN
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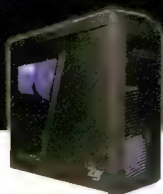
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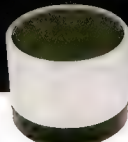
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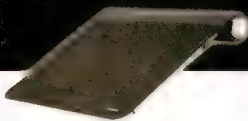
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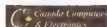

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Populate The Windows 8 Start Screen With Games & More

Valve's Gabe Newell gave gamers pause when he recently called Windows 8 "a catastrophe for everyone in the PC space." Suddenly, those of us who look forward to new operating system releases for the accompanying performance improvements and streamlined interface had a reason to be skeptical of Microsoft's imminent offering.

Now, Windows 8 is here, and after several weeks of using it on a regular basis, we can safely say that the situation isn't as dire as Newell might have led you to believe.

The Problem Starts Here

This month's project attempts to reconcile the split between the traditional Windows Desktop and the tile-infused Modern interface (formerly Metro). The Start screen that appears to be the defining feature of Windows 8 is the first thing you see when you boot your Windows 8 PC. For our part, we love the live tiles that give us a quick rundown of new emails, recent news items, weather forecast, and social media updates at a glance. We even like the static icons; they let you access lots of different apps (referring to "apps" in this context still feels weird) without making the screen look like a busy cluttered mess. The problem with the new Start screen is that only Windows utilities and apps (ugh) downloaded from the sparsely-populated

This month's project attempts to reconcile the split between the traditional Windows Desktop and the tile-infused Modern interface (formerly Metro).

Windows Store have been deemed worthy of Start's red carpet. The vast majority of our favorite applications, including games from Steam, Origin, and elsewhere are banished to the Desktop mode, where they're either pinned to the Taskbar or launched from Desktop shortcuts.

Tiles On Your Terms

This split ecosystem appears to be the source (pardon the pun) of Newell's comments, but Microsoft isn't limiting what you can install on your Windows 8 PC. Now, thanks to an Italy-based XDA Developers forum member who goes by

the handle Argony-OT, you can bridge the gap between Desktop and Start by creating large, attractive icons for any application you desire. Argony-OT's handy little utility is called OblyTile, and you can download and use it for free.

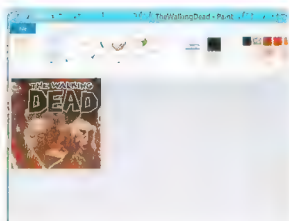
Steam Power Your Start Screen

For the purposes of this article, we focused on bringing our Steam games to Start. We're also assuming you already have a library of games installed on your Windows 8 PC. Begin by visiting tinyurl.com/a4ks78w and downloading the latest version of OblyTile. As we went to press, this was version 0.8.6. Next, you need to use your favorite web search engine to find icons for every game or application you want to bring to the Start screen. Launch a browser, choose an image search, and type the name of the game or application for which you're looking. For instance, we launched Google's image search and typed "Portal 2" into the search field and then pressed ENTER.

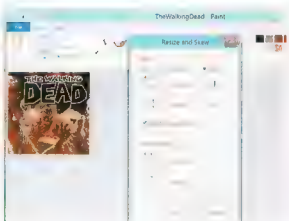
For each Start tile, you need a 120 x 120-pixel PNG image and a 30 x 30-pixel PNG image, each less than 200KB in size. Don't worry too much about the format or

Windows Tip Of The Month: Create A Shutdown Shortcut In Windows 8

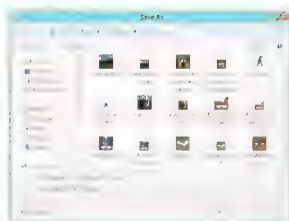
In order to shut down your Windows 8 PC, you must point to the lower-right corner of the screen to expose the Charm Bar, click Settings, and then click Power. You can also do a Settings search (Windows Key + W) and type **shut down**. But a quicker way to do it is to create a shortcut for your Desktop. Start by clicking the Desktop tile, right-click a blank spot on the screen and click New, and then click Shortcut. In the Location text box, type **shutdown.exe -s -t 00**, and then click Next. The shortcut name should appear on the following screen where you can change it if you want. Click Finish to complete the operation.



Crafting your own icons can be tedious, but the result is well worth the time and effort.



The large icons need to be 120 pixels square to work in OblyTile.



Rename the icons that will be 30 pixels square to differentiate them.

even the size; you can change those using an image editor once you download an image you like.

When you've found your image, save a copy to your system and open it in your favorite image editor. We used Paint because it's easy to use and accessible from any Win8 installation.

The first thing you'll want to do is make sure the image is a PNG image. If the image is already in PNG format, you can skip to the next paragraph. If you downloaded a JPEG, BMP, TIFF, or other image type, you'll need to convert it before you proceed. Open the file location, right-click the image, and then click Open With, and select Paint. Click File, Save As, click the Save As Type drop-down menu, and then choose PNG. Click Save to finish.

The next thing you need to do is crop it into a square. You can use circular icons, but they will clash with the Start's square and rectangular scene. If you already downloaded a square icon, you can skip to the next paragraph. For images that aren't square, don't resize them, as this will distort them. In Paint, we used the Select All command to drag the image toward the upper-left corner of the screen and then grabbed the edge marker in the lower-right corner of the image with our mouse pointer to adjust its dimensions until the pixel

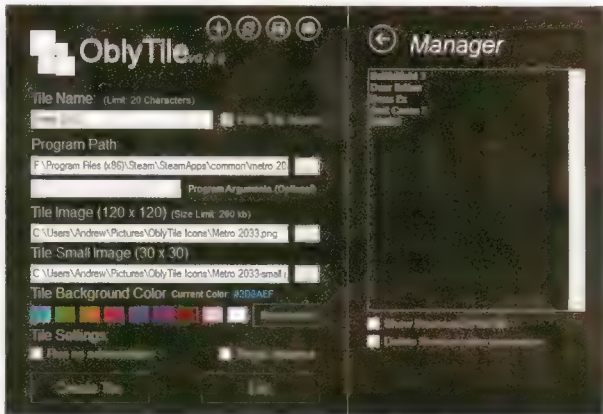
resolution that appears in the Status Bar at the bottom of the screen indicates that the sides of the square you can adjust are equilateral, for instance 512 x 512. Click the Save icon.

Next, click Resize, select the Pixels radio button, and type 120 into the Horizontal field. If the image is perfectly square, the Vertical field will automatically mirror the Horizontal field. Click OK to create your large icon. You're going to want to store your icons in a location that's not likely to change, so create a folder someplace, such as your Pictures or Documents folder and save your new icon there. Back in your image editor, choose the Save As option and add some indication that this is the

smaller icon; we typed "small" after the application name, and then clicked Save. Click Resize again, select the Pixels radio button, type 30 into the Horizontal field, and then click OK. Save this small icon to the same location as the large icon.

Repeat this process of generating large and small icons for every installed game in your Steam library. A side benefit of manufacturing your own icons is the ability to choose something other than the game's stock icon. For instance, between the TV show, video game, and graphics novels, "The Walking Dead" has a ton of great artwork on the web, so for our game's Start screen icon, we chose a hand-drawn zombie horde lumbering under the title.

The OblyTile Manager shows you a list of the icons you've already created, so you can edit them.





Title Time

Now jump into Desktop mode (press the Windows Key) and launch OblyTile. Input a tile name for one of your Steam games and either check or uncheck the Hide Tile Name checkbox to hide or show it, in white text, along the bottom edge of your tile. Click the Program Path button and click Choose File to navigate to the location of the game's executable. For most Steam games, you'll find this in the appropriate folder located in C:\Program Files (x86)\Steam\SteamApps\Common. When you've found the executable file, select it and click Open. Skip the Program Arguments field and use the corresponding buttons to tell OblyTile where to find your 120 x 120 and 30 x 30

We consulted this list of program arguments to fine-tune our shutdown tile.

icons. If your icon is square, you don't need to choose a background color. If you need to, you can use the checkboxes at the bottom of the utility to Run As Administrator or run a single instance, otherwise just leave them unchecked. Click Save Tile and then dismiss the pop-up by clicking OK. Press the Windows Key to return to the Start screen and admire your new tile. Repeat the process for each game you want to appear on the Start screen.

If you want to edit any of the tiles you've created, simply click the folder icon in the upper-right corner of OblyTile's interface and select the tile from the list on the right. Then just change the images, update the fields, add program arguments as you see fit, and then click Save Tile.

More Than Just Steam

OblyTile can do more for your Start screen than just Steam; we used it to show launch icons for a handful of Origin games, Minecraft, and more. We didn't like the look of the circular Chrome icon on Win8's Start screen, so we found another one. OblyTile also lets you create Start screen tiles for folders, such as your Photos, Music,

and Documents folders. To add folders instead of executables, launch OblyTile, click the Program Path button and click Choose Folder instead of Choose File, then just navigate to the folder you want to access from your Start screen.

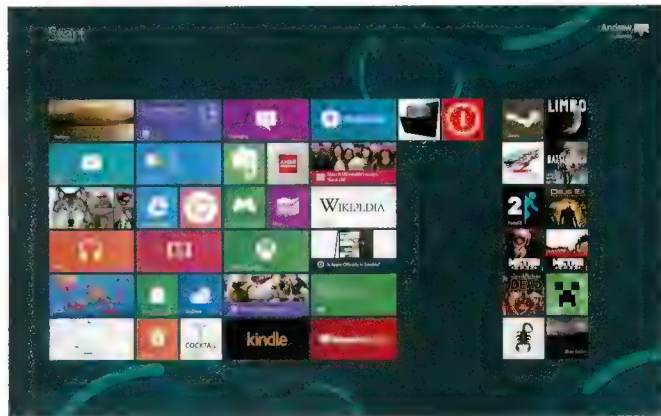
You can also make an OblyTile that's a shortcut for a specific command, such as Windows' Shut Down command. We used OblyTile to take the desktop shortcut icon from this month's Windows Tip Of The Month and turn it into a Start screen tile. After creating the 120- and 30-pixel square shutdown icons, we launched OblyTile, input a tile name, and input "C:\Windows\System32\shutdown.exe" into the Program Path field. We typed "-s -t 00" into the Program Arguments field (to shut down our computer immediately), added the two icons, and then clicked Create Tile. Now we can shut down the PC with a single click.

Choose Your Icon Images Wisely

Some images work better for Windows 8's Start screen icons than others. As we mentioned above, circular icons don't mix well with Win8's aesthetic, but that goes for any icon that's not square. You can use OblyTile's Tile Background Color option to fill in the edges of non-square icons, but the results may disappoint. Also, if you'd like to display the tile name, then avoid making icons with a lot of white along the bottom edge of the icon. That's because the tile name shows up as white text, and as we went to press, there was no way to change the color of the tile name text.

Make Windows 8 Your Own

OblyTile does require a little legwork on your part to set up. The end result, however, is a Windows Start screen that looks better and lets you get to work (or play) faster than double-clicking Desktop shortcuts in Windows 7. That's what we call progress. ■



Windows 8, ready to game thanks to OblyTile.

Inside The World Of Betas

Gotcha! Data Backup 0.5.0.3

If you've never tried moving your personal data between machines, you might think that it's just a simple matter of copying the My Documents folder (or Windows Vista/7's Libraries), but that's only the basics. Do you know where your fonts live? Where do you put them on the new machine? What about license keys, favorites, Outlook PST files, etc.? You could always turn to the infinite wisdom of the web, but you'd better hope you don't rely on incorrect or incomplete information.

Or you could make your life easier and use Gotcha! Data Backup, which is totally free and pretty easy to use. After you download the executable, you can launch it from any destination—even a thumbdrive. When you launch the app, a large checklist appears, divided into categories. The System category covers Fonts, Drivers,

SharedDocs, and various Microsoft product keys. There are also categories for each of the system's users, covering Desktop files, IE Favorites, Libraries, downloads, Firefox settings and plug-ins, and Outlook mailstores and settings. Just place a check mark next to what you want to transfer, select a destination with lots of space, and click Backup. To restore these things, move the storage area to the new machine, run Gotcha! Data Backup, and click Restore. The data isn't encrypted or compressed, so you can restore items manually, as well.

We'd like to see the addition of a Cancel or Pause button (to stop or suspend the process once it's underway). An indicator estimating copy size would be nice, too, but these are small quibbles for a tidy app that can save lots of time and effort. ■



Gotcha! Data Backup 0.5.0.3

Publisher and URL: RVM, integrator.signetsoftware.com

ETA: Q4 2013

Why You Should Care: Moving personal data and files has never been easier.

FreeFixer 0.69

FreeFixer is a startup app manager that leverages the power of the cloud, in the form of databases from the FreeFixer website that the application knows about. Just run FreeFixer and let it spend a few moments scanning your system. What results is a huge list of startup apps, browser helper objects, Explorer toolbars, active processes and background services, and so forth.

To prune this potentially long list down, FreeFixer automatically whittles known-good files (basically, those from Microsoft and several trusted publishers such as Apple, Adobe, Symantec, and others); such files appear on FreeFixer's list in green and are missing the delete checkbox everything else has. The remaining files have a checkmark that, when clicked, will force-delete the specified files.

FreeFixer 0.69

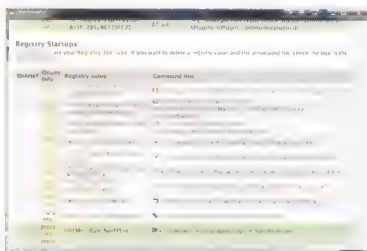
Publisher and URL: Roger Karlsson, www.freefixer.com

ETA: Q4 2013

Why Should You Care: The cloud can help manage your Windows autostart items.

Every entry on the list has a More Info link, which jumps to the FreeFixer website and displays all the info you'd ever want to know about that entry, including what it is, who wrote it, how many other users decided to keep it or delete it, and if VirusTotal has identified it as a virus. Armed with this knowledge, removing unwanted startup items from Windows is easy.

FreeFixer plays for keeps: You can't simply disable something in case you want



to enable it later. You either delete it or leave it. FreeFixer requires a web connection to work its magic, which could be a problem if a malware infection kicks you offline. It's also impossible to remove a whitelisted item, should you actually want to.

Still, such in-depth tools have their place, and FreeFixer is a worthy addition to any troubleshooter's toolbox. ■

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SilentNight

Series

500W

TACHYON

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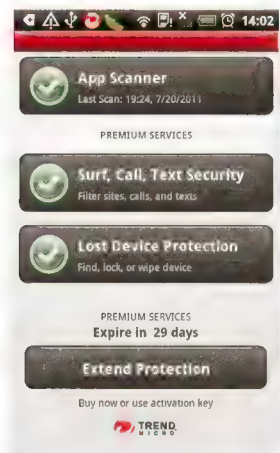
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www.youtube.com/rosewillinc



Trend Micro Mobile Security Personal Edition

If you have an Android-based device, you are a target for cybercriminals, spammers, and malware manufacturers. And unless you're willing to give up on all the things that make Android unique compared to Apple's iOS and Microsoft's Windows Phone 7/8, you'd do well to protect your beloved platform. Google Play has a dozen or more so-called threat scanners, but Trend Micro's Mobile Security Personal Edition offers an impressively comprehensive feature set.

The free version features a built-in Threat Scanner for apps, which scans every app you currently have installed and prevents any new app from installing until it has been scanned; only apps that pass the sniff test are allowed to proceed to the install step. Viruses and other malicious apps stop here. The free version of Mobile Security Personal Edition also supports free threat scanner updates and Threat Scanner: Cloud, which makes sure you remain protected with unlimited cloud scanning connections. Trend Micro also offers free technical support and an ad-free experience with the free edition.

For an annual \$29.99 fee, however, you get a much more proactive and all-encompassing security suite for your Android device. Features include a Privacy Scanner capable of alerting you to the presence of any spyware apps that collect and potentially steal private information.

You can also surf, call, and text more securely thanks to Trend Micro's Smart Protection Network, which blocks malicious websites. Built-in parental controls let you filter inappropriate websites using age restrictions. Call and text filtering enables you to create whitelists and blacklists for contacts. Immediately after performing our first scan, the app notified us that three bookmarks synced from our Google account were malicious, and between the multiple PCs and mobile devices we've synced those bookmarks to, Trend Micro's Mobile Security Personal Edition was the first security application to notify us of this.

This application also helps you recover your device if it's ever lost or stolen, using Google mapping via GPS, cellular towers,

or Wi-Fi. It also lets you remotely trigger a loud alarm sound (even if it's in silent mode), lock your device, and/or wipe it completely, returning it to its factory state and removing any personal data. The app automatically locks the phone if the SIM card is ever removed, and because Mobile Security Personal Edition requires your Trend Micro password to uninstall the app, your device's thief won't get off the hook that way.

Trend Micro Mobile Security Personal Edition is far and away the most complete security solution we've used on Android. It replaced our scanner app, device recovery app, and call and text blocker, and gave us a ton of useful extras. As we went to press, you could download the free trial and enjoy the app's premium features for 30 days. So don't take our word for it, see for yourself. ■

BY ANDREW LEIBMAN

Mobile Security Personal Edition (Android)
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Source: U.S. Census Bureau, *Marriage, Divorce, Remarriage*, 2004.

Upgrades That'll Keep You Humming Along

The release of Windows 8 continues to drive new versions of existing applications. This month's haul of software updates caught a few brand-new titles, as well.

Software Updates

Apple Final Cut Pro X 10.0.6

Video editor FCPX gets a point release update with a handful of improvements. Most notable among these is support for the RAW format of popular HD cameras from RED. Multichannel audio handling receives some enhancements, as well, as do XML file management, MXF plug-in support, import/export operations, clip controls, and clip comparison viewing.

apple.com/finalcutpro

Audials One 10

Version 10 of the online media recording and conversion suite comes with broader format support, faster transcoding, and three new recording modes. Audials now has profiles for recent mobile devices including the Surface, Nexus, and new iPad, plus more effective ways to find the specific music you'd like to hear. Finally, there's cloud and Windows 8 support.

audials.com/audialsone

InstallAware 15

Automatic web updating is a major new feature of this Windows Installer program; it ensures that users will install the latest edition of your application. Also new is Native Code Setup Engine 2.0 for greater installation success on locked-down systems. Besides its paid editions, InstallAware 15 also comes in a free edition for users of Visual Studio.

installaware.com/

Microsoft Dynamics CRM Online

Redmond's own customer relationship management software gets a service

update with support for Microsoft Office 2013 and improved support for popular browsers. Also new are preset "best-practice" process definitions to aid users in a variety of sales and service tasks. Microsoft also gives CRM deeper integration with Skype, Bing maps, and Yammer.

crm.dynamics.com/en-us/home

O&O MediaRecovery 8

This utility for rescuing lost media files from flash media receives optimization for Windows 8 and other enhancements. Intended for recovery from memory cards, internal camera memory, USB flash drives and more, MediaRecovery 8 can work in conjunction with O&O DiskImage (sold separately) to make a recoverable, forensic image of data stored on damaged hardware.

o-o-software.com/en/products/oomediarecovery

Paragon Alignment Tool 4.0 Professional

Misalignment between a hard drive's logical partition sectors and its actual, physical sectors can greatly slow down its I/O. PAT non-destructively realigns even OS partitions so you don't leave performance on the table. New features in version 4.0 include 20% faster realignment sessions; recovery tools; a bootable, WinPE edition; and support for Win8.

paragon-software.com/home/

SmartDraw 2013

A new cloud service, along with new mobile and online sharing features, grace

the latest edition of this rich content visuals generator. SmartDraw gives you an easy way to whip up professional-looking flowcharts and diagrams, replete with hyperlinked content, notes, and attachments. What's more, there's task assignment, tracking, accountability, and follow-up features, too.

www.smartdraw.com/visual-templates

Trend Micro Apps

Three new Windows 8 apps from Trend Micro are now (or soon will be) available through the Windows Store. The first, Trend Micro SafeGuard, is a security-hardened browser for Win8 tablets. Go Everywhere, meanwhile, is an app to help users locate a lost or stolen device. Lastly, DirectPass for PCs and tablets is a password management tool that allows for cloud synchronization among your Win8 devices.

www.trendmicro.com/

Driver Bay Intel Solid-State Drive Toolbox 3.1.1

Hard on the heels of version 3.1.0 is this latest edition of Intel's management/firmware update software for its SSDs. Version 3.1.1 corrects an issue in which certain Intel drives are wrongly reported as degraded. Among version 3.1.0's more numerous features are support for Windows 8 and Server 2012, TRIM on a RAID 0, and Plug-and-Play drive mounting/unmounting.

downloadcenter.intel.com

Symantec Norton Utilities 16

The value we place on convenience differs depending on any given society's cultural norms, but in our globalized, digital lives we assume its inclusion in almost every application and service. Nonetheless, the many advantages of an all-in-one PC maintenance kit like Symantec Norton Utilities 16 make almost any PC user appreciate utility programs as more than just a necessity.

Fundamentally, Norton Utilities is designed to clean up, tune up, and speed up your PC. To see a birds-eye view of your system's well-being, you can examine its health and performance on the easy-to-reference Dashboard. The Dashboard features quick-check data points such as local disk capacity, startup efficiency statistics, history of privacy scans, and system-boosting suggestions, such as "Clear Document History" and "Bleach Free Disk Space." In addition, you can use the 1-Click Optimization widget (with a dial that indicates your system's health status) to perform a brief scrub-and-rinse. This handy tool cleans the Windows Registry, deletes privacy data, and defrags as necessary.

Flanking the Dashboard are the Performance, Privacy, and Recovery (plus, Settings, which allow for further PC optimization, of course) sections. These display diagnostics in a tri-pane format, highlighting a recap of your most recent activity, steps you can take to improve your PC efficiency, and a list of clickable actions. For instance, in the Performance section under Summary you'll see your latest Registry scan, Registry issues discovered (in addition to those repaired), and your last system disk defrag.

Under Recommended Actions to enhance performance, Norton Utilities advised us to compact the Registry and defrag the system drive on our Windows 8 desktop. Nothing unexpected here, but you'll probably appreciate that these suggestions are easy to execute in the

same window. For instance, click once on the Compact Your Registry icon and the program walks you through the appropriate steps to reallocate wasted space and increase application responsiveness.

In the Privacy section you'll find standard house-keeping features for browser cleanup and file deletion. Here, you can clear your Windows or browsing history; remove third-party software history; discard all traces of previously deleted files from selected disks; and permanently shred files and folders, each with a single click.

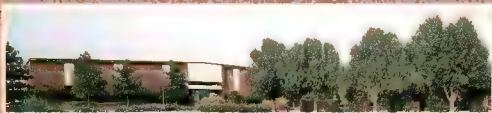
If you're primarily interested in the functionality of Norton Utilities' backup and restoration capabilities, the Recovery toolkit is full of helpful options. Unerase drives by performing a quick scan, deep scan, or physical scan. Alternatively, you're allowed to choose which files you intend to scan; or start a custom scan by entering a file mask or name. Duplicate file scanning will check your preferred drive locations and prepare unwanted files for deletion. Aside from repairing drives and restoring registry backups, you can also use Utilities to uninstall unnecessary programs that linger on your drive.

On the whole, Norton Utilities covers all bases by monitoring irregularly checked symptoms you may not notice independently. Beyond accurately assessing your machine's operational



health, Norton Utilities conveniently houses all the optimization and efficiency tools you need under one well-designed roof. ■

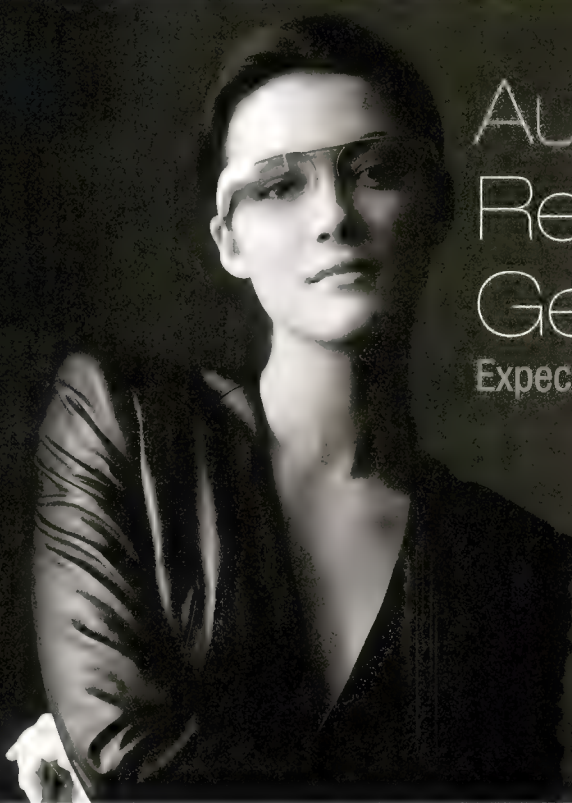
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A black and white photograph of a woman with dark hair, wearing a dark, possibly leather, jacket. She is wearing a pair of futuristic, transparent augmented reality glasses that cover her eyes. The background is dark and textured.

Augmented Reality Gets Real

Expect Big Things In 2013

In the future, you may view augmented reality content through glasses like these, from Google's Project Glass, or even contacts.

Modern smartphones are powerful little computers, and developers are coming up with exciting ways to take advantage of all that mobile technology. One of the most intriguing innovations is augmented reality, which superimposes graphics, audio, and other virtual enhancements over a real-world environment. We've seen these types of enhancements in sports broadcasts for years, such as the virtual first down line in football and the glowing halo tracking cars during NASCAR broadcasts. The mobility of a smartphone (and its built-in technology) lets you point the camera at a real environment where you can see

interactive and informative data about the things onscreen.

How Augmented Reality Works

Today's augmented reality apps on smartphones and tablets take advantage of GPS coordinates and electronic compasses to know where you are and which direction you are facing. The remaining pieces of the puzzle are a built-in camera and access to the Internet. Based on the location information provided, augmented reality apps on your smartphone or tablet can use the data stored about a given location to place

graphics over the objects and buildings in the field of view presented by the device's camera. The camera can also be helpful for augmented reality apps that require object recognition, reading barcodes and QR codes, and motion detection.

Augmented reality isn't limited to smartphones and tablets. Head-mounted displays, such as glasses or a visor have also been mentioned as possible devices that could support augmented reality. One project in particular, Google's Project Glass, uses a pair of glasses featuring a clear display above the right eye, and the glasses can even let people send and receive messages through

voice commands. A built-in camera on the side of the glasses can also record video and take pictures. Biotechnology may also make augmented reality a possibility for contact lenses in the future. There's vast potential for augmented reality with glasses and other wearable technology, but we found that most every option was currently in the testing phase.

"Some applications may focus on geolocation and those will use things like GPS, magnetometers, and various indoor position technologies, such as Wi-Fi and RFID," says Gartner Principal Research Analyst Tuong Nguyen. "Other sensors, such as gyroscopes, accelerometers, altimeters, and barometers can all be used to enhance augmented reality, depending on the application."

The Smartphone Is The Key

Without smartphones, augmented reality applications would be fairly limited. Nguyen says that "In the past couple years, smartphones have become robust enough to begin handling the vigorous requirements to deliver an acceptable augmented reality experience."

For example, augmented reality requires both a powerful processor and accurate visual identification to deliver the experience with speed and accuracy. One of the key developments, notes Nguyen, is the user interface and touchscreen found on smartphones.

"Spearheaded by iOS and iPhone, the touch experience has become essential to

how users interface with the augmented reality applications."

Being a new technology, augmented reality has barely begun to reach its peak, Nguyen says.

"The technology is moving along as expected. I think what's more important are the applications. Technology for the sake of itself is often challenged in reaching the mass market. When the application adds value for consumers, that's when it's able to reach its fullest potential."

Augmented Reality Now

Many current smartphone apps present you with key points of interest and other graphics overlaying a street map. For example, there are touring apps available that analyze your location and bring up icons that point out landmarks, hotels, restaurants, and other points of interest. You'll also see some apps that are capable of superimposing graphics over live video from your smartphone's camera. For example, some navigation apps can also overlay directional arrows over the real-time video, so you'll be able to see where you're going to turn, which is helpful in situations where there are several possibilities near the exit you want.

There are also apps like Layar (www.layar.com) that can scan paper and text around you to provide extra information and interactive content, such as online prices, links to product websites, and other digital content. Just some examples of print enhancements include magazines, billboards, restaurant menus, and

grocery products. As more and more people become familiar with augmented reality options, we'll see more tailored apps. For example, those in the market for a home can now drive past a preferred neighborhood and view price estimates for listed houses, and they can click a link on the page to view photos, email realtors, and request a home showing.

Geotagging and augmented reality could prove to be a powerful combination, as the location-based social networking capabilities of geotagging could be used to leave notes for friends, links to photos taken by friends at a given spot, and so on—all seen from the lens of your smartphone or tablet.

Nguyen tells us, "At the moment, there's an overwhelming, large use of it in marketing as advertising. These implementations usually add a 'wow' element to the campaign. This is usually a poster, billboard, magazine ad, or a QR code that allows the consumer to hold their phone up to it and interact with the ad."

For instance, one Esquire magazine campaign had customers visit Barnes & Noble locations where they could have their picture taken with supermodel Brooklyn Decker, who is added to the camera's image via augmented reality. Similar types of promotions have been used by other companies looking for new ways to market products and drive traffic to retail locations.

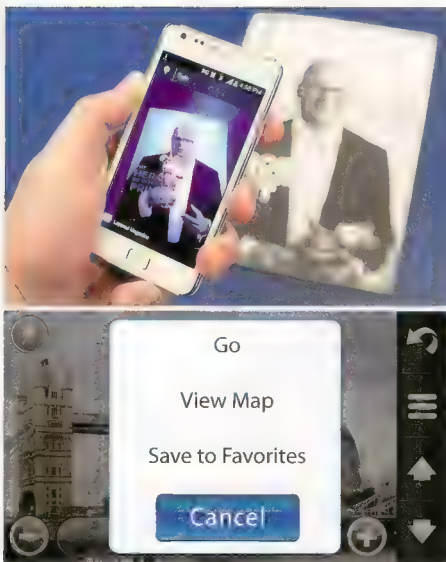
Short-Term Gimmick Or Something More?

As you can see, there are many different uses for augmented reality apps, and with the technology just rounding into form, it's possible that we could see an explosion of augmented reality tools in the near future.

Asked how he'd rate augmented reality technology's stage of development on a scale of 1 to 10 (10 being high), Nguyen says: "I am of two minds on this. The first is that it's the early days and we're five to 10 years out before augmented reality is a mainstream technology for consumers (mainstream being equated to how people use IM, SMS, email, web browsing). On the other hand, I expect that over the next 12 to 18 months we will start seeing different companies ramp up adoption for augmented reality applications both internally and externally."



Some navigation apps feature augmented reality tools.



Augmented reality can add online links and interactive content to print content.

The combination of geotagging and augmented reality capabilities seems to have great deal of potential.

One breakthrough application that people can't live without may be all that it takes for augmented reality to move into the creative focus of app developers. And the apps don't necessarily need to be tied to smartphones. At CES 2012 in January, car manufacturers showed off a future where you'd be able to see icons on your vehicle's windshield. As you drive, you'd see real-time information about the nearby locations, such as what band is playing at a nightclub and if there are tables left at the café up the street. To learn more about something, you'd just tap the icon.

As to what types of advancements he expects to see in augmented reality over the course of 2013, Nguyen says, "I expect an increasing number of companies to look towards augmented reality to enhance both internal and external processes. Initially, the hype around augmented reality had been mobile geo-location. As that has waned, we're already seeing a shift towards visual ID-based augmented reality. Moving forward, augmented reality will be a mix of both of these and depend on the application."

Future Applications

There are many potentially excellent uses for augmented reality in education, travel, and tourism, but the technology could be implemented in most any situation where you'll need to reference an online source or want to provide more information for consumers. Imagine that you're a repair person who services hundreds of products from several brands. You could call up manuals just by pointing your phone's camera at the device. Or, it's possible that paper manuals could have augmented reality links that lead you to how-to videos and images that you can view on your phone, such as the types of tools you'll need to fix a problem.

Cities could provide historical data by creating an app that would display relevant information and old photos over wherever you point your smartphone's camera. Retailers could use augmented reality to call out sales for those walking or driving. And while shopping within, you could simply look at a product to find out more where it was made, or features that may not be obvious from first

glance. Whatever the case, developers will need to find a way to provide consumers with a good reason to use augmented reality.

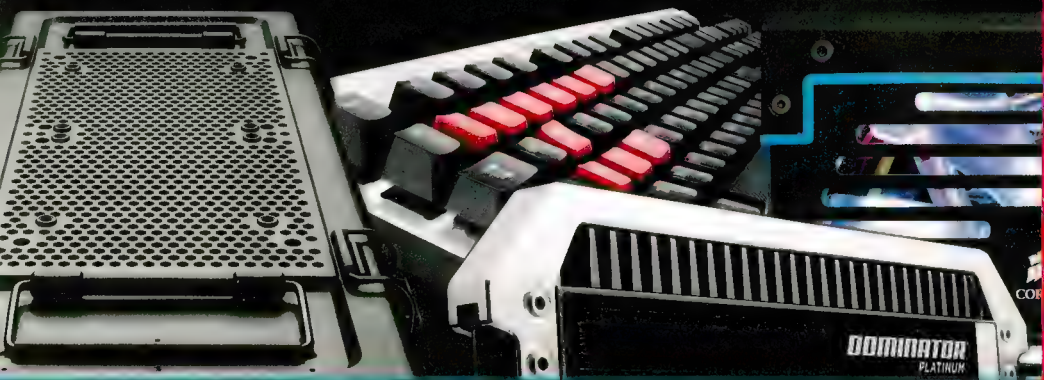
"I think use cases are key to adoption," Nguyen says. "I'll give you an example of what I mean. Many of the AR cases we see today in marketing as advertising are just a 'wow' factor. There's no compelling reason for a consumer to re-engage—not with that specific campaign, but any campaign. If the augmented reality ad is only providing me with a digital ad that takes more time for me to access, requires more effort, potentially costs me money if data is required, or is on a smaller screen, there's no compelling reason for me to try it multiple times. In this scenario, I could just as easily access the information elsewhere."

The flip side of the coin is when AR can engage you in the experience. Nguyen suggested things like "following some clues to another ad to win something, allowing me to purchase something, or providing me with additional information to supplement my current experience—such as more information about a certain animal or its behavior while I'm at the zoo."

We love new toys as much as the next early adopter, but one thing is clear. Looking toward the future, going beyond the novelty of AR and finding ways to use it to solve problems and improve existing systems will be the most important job of augmented reality developers. ■



Retailers can use augmented reality to drive sales.



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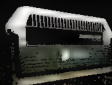
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Game Of The Month

Yeah, we know you have blogs to post, video to encode, reports to write, and code to compile. We do, too, but you have to take a break once in a while (and maybe blow some stuff up). That's why each week we give you the lowdown on what to expect from the latest interesting PC and console games.

HALO 4

\$59.99 (X360) • ESRB: (M)ature
Microsoft Game Studios • www.xbox.com/halo4

Return Of The Chief – by Chris Trumble

Halo 4 picks up right up where Halo 3 left off: The Chief and Cortana are still floating along in the icy remains of what was once the aft section of the UNSC *Forward Unto Dawn*. They've been doing nothing but that for four years when the ship is unexpectedly boarded by an unknown force, prompting Cortana to wake the Chief from his cryo-slumber.

So begins the next chapter in the Halo saga, a story arc as epic as just about any in science fiction. Story has become increasingly prominent in each of the last few releases, and in Halo 4 it hits a crescendo, pulling in enemies old and new, and bringing into sharp focus the relationship between Cortana and the Chief. You'll learn things in Halo 4 that you may always have wondered about, just as you discover new things to wonder about.

As excellent as the story is—and it is every bit of that—this is a videogame after all, so gameplay is crucial, as are video and audio. Gameplay news is all good; the game for the most part adheres to time-tested control elements and level design philosophy, and where it deviates, the new stuff is golden.

Halo 4 has a broader color palette than previous Halo games, and character models, vehicles, and environments alike have a sharp realism about them that is almost startling at first. We like everything about the game visually, including some of the best facial animation we've seen to date in a game on any platform. And for the most part, it sounds pretty amazing, too, although we have to admit that we miss Marty O'Donnell's familiar stamp on the game's music. That's not to say that the music isn't good, it's just that O'Donnell's stuff for us became almost as big a part of Halo as Cortana and the Chief did. We also were initially disappointed with some of the changes 343 made to gun sounds, but this is a lesser concern.

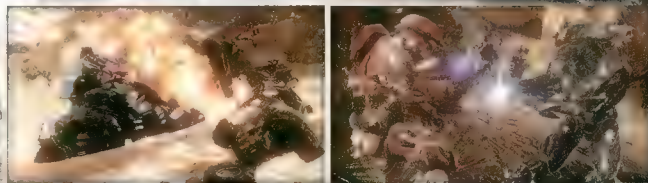
The campaign is a bit shorter than we'd have liked, but it's very good, with just the right blend of FPS action, set piece levels, and plot-advancing cinematics. Halo 4 explores the human side of its grand events in much greater depth than any shooter before

it, and this gives the campaign a surprising amount of weight. If you've enjoyed these games at all in the past, and if you've ever identified with any of the characters even a little, you'll care about the events that unfold in Halo 4, and you'll find yourself anxiously awaiting more of the story when you're done.

All multiplayer options in Halo 4 except for co-op campaign play are available via the Infinity menu option, which will make sense once you've spent a bit of time in the campaign. Firefight is gone in Halo 4, but it has been replaced by the cool, episodic Spartan Ops missions, which are very much like Firefight only with mission objectives and wrapped in a story all their own. Traditional multiplayer is alive and well, and has some refreshing changes, such as personal ordnance drops and a greater level of armor and ability customization that may seem daunting at first, but which really freshen things up.

Forge, Saved Films, and the online File Share for your favorite clips and screenshots are back, and everything works as you'd expect. Forge is even a little easier to use than previous incarnations, making it more fun for novices to jump right in and start building levels.

People gravitate to various games for reasons as different as they are, but based on initial sales and our experiences with this game, we have no trouble whatsoever recommending Halo 4 to longtime fans and new ones alike. Halo 4 is everything an FPS should be, and more. ■



ASSASSIN'S CREED II

Rumble In The American Revolution

— by Andrew Leibman

\$59.99 (X360, PS3, Wii U), \$49.99 (PC) • ESRB: (M)ature
Ubisoft • assassinscreed.ubi.com

Despite being the fifth game, *Assassin's Creed III* is the third numbered title in the third-person adventure game series. The game features present-day assassin Desmond Miles as he memory-hops through time using a brain-jacking chair not unlike the one in "The Matrix," called the Animus. Through his ancestral memories, Desmond spends a good portion of the series killing Templars, crooked clerics, and evil politicians in a quest to recover mystical artifacts purported to avert the apocalypse.

The game is a direct sequel to *Assassin's Creed Revelations*, but instead of playing as Ezio Auditore again (AC2, AC Brotherhood, AC Revelations) or Altaïr ibn-La'Ahad (AC1), you play the lengthy prologue as the British-born Haytham Kenway as he establishes a presence in the American colonies just prior to the American Revolution. For the majority of the rest of the game, you play through the memories of a half-Native American named Ratonhnhakéton, which is eventually shortened to the more pronounceable "Connor."

Compared to previous entries in the series, AC3 feel much larger, both geographically and conceptually. There's more to explore, more to do, and loads to see. In AC3, the sometimes convoluted but thoroughly engaging narrative breaks new ground. For instance, you get new insight into the Templar Order that makes them less the villains the previous games portrayed them as.

The game is running on an updated graphics engine, and despite a few graphical glitches (guns that float in the air, townspeople that spontaneously vanish) colonial America is alive and beautiful to behold. The cities and towns are teeming with NPCs engaged in various activities, dogs and chickens vie for your affection, and street urchins hound you for attention. Snow, rain, and fog effects and day and night cycles add additional layers of texture to the environment, often affecting gameplay. The architecture and settings feel period-accurate and lush; while playing AC3, we couldn't shake the feeling that we were living inside an extremely detailed museum exhibit.

As you explore, you collect snippets of history

about locations, people, and technologies that you can view at any point. We recommend you do. They are not only informative, but entertaining as well. You'll also get a chance to shoot the breeze with Benjamin Franklin. Do not pass up this opportunity.

AC3 is not a game for everybody, but most people who play it are sure to find a few things they love. The intricate combat system punishes button mashers and favors timing your kicks, punches, stabs, and shots. Once you master the combat, you're in for a thrill as you chain multiple cinematic kills together while free running and leaping from trees, horseback, and all manner of objects around the battlefield. Those who loved AC2's villa-building side mission will enjoy the chance to build up your own homestead. You can also recruit fellow assassins, infiltrate and decimate forts, hunt animals, engage in naval warfare from the deck of your own ship, and more.

Although this is the final game in the series to focus on Desmond Miles, Ubisoft has plans for future entries in the series. If those games are as good as this one, we'll gladly climb back into the Animus for another go. ■



CALL OF DUTY[®]

BLACK OPS II

A Healthy Mix Of Old & New

— by Josh Compton

\$59.99 (X360, PS3, PC, Wii U) • ESRB: (M)ature
Activision • www.callofduty.com/blackops2

For years, Treyarch has been seen as the little brother of Infinity Ward, trying hard to nail down the Call of Duty formula but always coming up just a bit short of the IW titles. It seems ridiculous to nitpick at separate entries in the same franchise considering how wildly successful each new title is, but because there are two companies taking turns every year, comparisons must be made. With Call of Duty: Black Ops II, it's safe to say that Treyarch has caught up to Infinity Ward in surprising fashion, at least in terms of the multiplayer experience.

Call of Duty campaigns aren't necessarily known for emotional storytelling. Instead trading touching moments for adrenaline-pumping action set pieces, so we weren't expecting much from Black Ops II. Treyarch tried to infuse some new life into the regular formula with the addition of some story-based choices that will give you one of a few different endings depending on your actions. It's a good start, but we would've liked to have seen more.

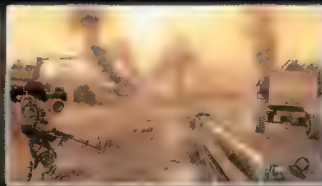
The father-son storyline between Alex and David Mason is borderline interesting, but once you get into the firefights, everything gets lost in the fray. Plus, the same Call of Duty staples survive, including the never-ending enemy spawns until you reach a certain checkpoint. It's all very familiar, well-trodden territory that will make you feel like you're going through the motions. But where Treyarch stuck to the tried and true of past campaigns, there are enough changes to the multiplayer experience to more than make up for any single-player shortcomings.

The first Black Ops brought players back to the 1960s and used the technological limitations of the period to breathe new life into the multiplayer experience. Black Ops II takes a different approach by transporting you to 2025 and adding quite a few new toys to your arsenal. In addition to new guns and sights, Treyarch also added new killstreaks to the game, including the Hunter Killer AI-controlled drone, lightning strike mortar attack, and more. It all feels appropriately futuristic and gives players more opportunities to bring the pain. And because killstreaks are point-based achievements, objective players will be able to reap their rewards more often, as well.



The real difference between Black Ops II and past Call of Duty entries is the class creation system. Instead of choosing one item from multiple preordained slots, depending on your level, you can choose any 10 items you want. If you want a primary weapon with two attachments, no secondary, five perks, and two grenades, you can do it. The level of freedom in creating classes gives Black Ops II a much more customized feel that old and new players are going to appreciate.

Even without monumental changes to the single-player campaign, Black Ops II is still a lot of fun. The multiplayer is much smoother and more fluid than the first Black Ops game, and it appears that Treyarch is really hitting its stride with a mix of traditional Call of Duty elements and a few spots of innovation. Needless to say, Treyarch has emerged from Infinity Ward's shadow and is the scrappy little brother



NEED FOR SPEED MOST WANTED

Flashes Of Brilliance – by Chris Trumble

\$59.99 (X360, PS3); \$49.99 (PC) • ESRB: (E)veryone 10+ • EA • www.needforspeed.com

EA's Need For Speed franchise dates back all the way to 1994, which in videogame years makes it 714 years old. For the most current installment, Need For Speed Most Wanted, EA decided to turn the reins over to subsidiary developer Criterion, makers of the hugely popular Burnout series, as well as 2010's Need For Speed: Hot Pursuit.

As such, it's not surprising that Most Wanted is a great-looking arcade racer that does a lot of things very well. For starters, the game looks incredible. The car models are amazing, as is Fairhaven City, an expansive urban romper room that Criterion built just for you to drive in. The game's audio is equally impressive, featuring spot-on car sounds and excellent environmental noise. Most Wanted also does a great job of showing you slow-mo replays of your crashes, gives you an incredible selection of cars, and makes street racing a heckuva lot of fun in general.

The game gives you a convincing sense of the speed at which you're hurtling through the streets, and because it's an arcade-style game, it doesn't punish you the way a simulator would for your mistakes; depending on your tastes in racing games, this may be good or bad. Either way, it's fun to take these cars for a spin at ridiculous speeds, and Criterion built in some cool progression mechanics and an online play system that makes online racing a seamless process.

EA touts the game's easy access to its sizable car collection; this is a matter of some contention, however. On the one hand, it's cool and somewhat novel to be able to jump right into a supercar within minutes of loading the game for the first time, but on the other hand, it robs you of the sense of accomplishment other driving games provide when you finally unlock a car you've been dying to drive.

We also found it somewhat disappointing that once you've taken a car from its "jack spot," you can't add it to a garage or some sort of virtual collection. You have access to the car for the rest of the game, but only through teleporting to its jack spot on command. Call us shameless materialists, but we like a game that lets us store the cars we've stolen in a garage or something.

We also would have liked the option to select a manual transmission. Yes, this is arcade racing and not a simulator, but even Spy Hunter let you shift up once.

These things aside, the game is a very solid entry in the genre. Earning Speed Points for the right to face off against Fairhaven City's 10 Most Wanted racers is an engrossing pursuit, and the many police chases you'll be part of along the way are sure to get your pulse pounding. Add to that the game's inventive use of billboards to dangle your friends' accomplishments in front of you and decent damage modeling, and you have a racer that will keep you coming back for more. ■



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Freelance CG Artist Gabe Selinger Talks About The Tools Of His Trade

Gabe Selinger is a 22-year-old freelance CG artist. He graduated in fall 2011 from the Art Institute of Portland. While in this final year of school, he started his career creating videogame art for Liquid Development, a company based in downtown Portland, Ore. In the course of his work for Liquid, he works on games like the PC MMO *Firefall* and other unannounced AAA titles. You can check out some of Selinger's work at www.gabeselingerart.com.

Q Can you take us through the process of creating CG art assets for use in games? What is an average work day like for a freelance CG artist?

GS I spend most of my day in front of my monitor making art for commercials or videogames. The process generally starts with either concept paintings that another artist has created or some reference photos for something I need to make for a game. Each individual creation is referred to as an asset. Included alongside the concepts are the technical requirements and specifications of the asset, such as triangle count, texture sizes, naming conventions, etc. Once all this information has been considered, I start creating the asset; making a 2D image come to life in three dimensions while submitting images to the client for feedback along the way. Unlike 2D art, 3D art and specifically videogame art needs to look great from every angle, since the world is alive and interactive. Extra care and attention to detail are a necessity to achieve professional-quality work.

Q So, to complete a single in-game object, or asset, you have to run lots of pretty high-end processes to design and render the items you create, right? What software tools do you use, and can you give us some examples of the compute-intensive tasks you frequently run?

GS I utilize various versions of Autodesk Maya and 3ds Max for



traditional modeling, Pixologic's ZBrush and Autodesk Mudbox for 3D sculpting, and Adobe Photoshop for texturing. There are tons of other small programs and plug-ins that I use, as well, but those are the main ones. Each client may have a preferred program or file type they want their files submitted to them in. Each and every 3D model is made up of triangles. I need the ability to view, manipulate, and render millions of triangles on-screen, which can be very hard on a computer. The purpose of working with such a high-resolution model is to transfer all that information to a low, game resolution mesh through the textures (creating normal maps, ambient occlusion maps, etc.) in a process called "baking." Baking is equally intensive and

time consuming as rendering but integral to creating the asset. Sometimes the client or art manager will have feedback for the asset, which can mean having to go back and revise things, potentially rendering and/or baking millions of triangles again. One of the final processes is texturing. When texturing in Photoshop, I need to use a non-destructive creation process, which means working in such a way that all my details are kept independent of each other in separate layers, so I can make changes and adjust to feedback quickly. At high texture resolutions, this method can result in huge Photoshop files that have hundreds of layers.

Q Is it fair to say that your productivity is to some extent limited by the power of the system you're using?

GS Yes, having a computer that is slow can not only hamper productivity, but also creativity. If I have the talent and want to work on the most challenging assets, like characters or vehicles, I need a computer that is up to the job and can keep up with my flow. The nature of the industry is such that the main constraint is always time. Deadlines are short and have the potential to become very stressful; being late repetitively can cost you your job. Having a fast, powerful computer gives the freedom to experiment without the cost of falling behind. This encourages creativity and exploration, which can lead to artist breakthroughs and problem solving.

A computer that lags, crashes, chokes up, or otherwise slows you down leaves little time to branch off and overall stifles creativity. There's nothing more frustrating than working late Friday night into the morning to meet a deadline and having my computer constantly freezing up because it can't keep up with me.

Q How long does it take on average to run all of these tasks on a typical PC?

GS Each asset is different; they vary in detail and complexity. Something small, like a hat or an accessory, may take a couple of days to finish. Something more complicated like a character or vehicle can take anywhere from three to five weeks or more to create. Licensed characters take a particularly long time because the client usually has a lot of feedback to preserve the look and feel of their IP.

Q Once you've completed a single asset, do you then get feedback on that piece individually, or does the dev team usually have you submit multiple pieces at a time for evaluation?

GS Liquid Development has an internal website that is set up like a forum that the artists, managers, and clients all have access too. Each asset has its own thread, and the client can post

their feedback there. If you are working on multiple assets, you can potentially get multiple pieces of feedback in separate threads at the same time. Most the time there are a group of assets that a team has to complete for a common deadline called a "milestone." The goal is to provide images for feedback on the threads early enough in the process that if there are issues that they get caught early on in the process. That way they can be corrected moving forward rather than having to go back and redo stuff.

Q When you bill a developer for your work, do you bill by the hour, or by the job?

GS Most of the time there is already a set price for the job or asset. If not, I will evaluate the work and charge by the job based on my estimate of the amount of days it will take me to complete. Having said that, having an extremely fast computer can give me an edge, since I can complete an asset faster and start working on a new one while I wait for feedback. So I end up finishing more and earning more at the end of the day. This also helps leave an impression on my art manager or the client that I am of a caliber capable hitting deadlines and handling more challenging assets with higher price tags. It's a win, win deal!

Q Do you have your own workstation, or do you sometimes use the developer's hardware?

GS I actually have multiple workstations at home filled with all my expensive hardware, monitors, and gadgets, but the places I work for provide computers, as well. Unfortunately, they are sometimes not as recent as mine. Additionally, I have to re-personalize and reorganize all my workspaces to be how I am used to them. Working from home saves me the time of reprogramming hotkeys, re-installing plug-ins, etc.

Q What kinds of things would you look for when choosing components for a graphics workstation? For instance, the processor. Would you prefer a six-core monster like the new Intel Core i7-3970X Processor Extreme Edition, or would a quad-core like the 3rd Generation Intel Core i7-3770K get the job done? What about other components?

GS I'll be the first to admit that I am not the most tech-savvy computer person on the planet; I am an artist first and foremost. That being said, I understand the basics. It's important for me to go out and get the best processor I can buy—so I can process faster and try more iteration, experimentation, etc. I also definitely prefer to get a solid-state drive to store Windows, my big applications, and projects on. I timed it and it took six minutes for my old computer (with an HDD boot drive) to go from the off position to booted up with ZBrush, 3D Studio Max, and Photoshop open and responding. The supercomputer I'm using now took a minute and 40 seconds to complete those same tasks, so my SSD has clearly given me fast accessibility. And I'd get a big hard drive for data storage.

I'd get a motherboard with a lot of memory capacity for my big projects and fast ports like USB 3.0, Thunderbolt, etc. Since I work at home and in the office, I need to have fast access to the data that is on my thumb drives and external hard drives.



Also very important is a good graphics card, so I can see more detail in viewport previews, especially when viewing high-resolution meshes or models with high-resolution textures in the viewport. It's also awesome to play the games with my own art in them with all the visual settings jacked all the way up! There are also some other devices that are critical to any CG artist's workflow, like a Wacom tablet or, in my case, a Wacom Cintiq 24HD monitor which allows me to draw directly on the screen.

Q If you wanted to build the ideal system for the work you do, how much do you think it would make sense to spend?

GS The ideal system for me is the fastest one possible, regardless of the cost. Being a contract artist, I get paid per each asset rather than by the hour. This means that as soon as I finish an asset I can get paid and can move on to another. The faster my computer is, the faster I work, and the more I get paid. The new supercomputer I'm using now cost around \$3,000 dollars, but after completing a few milestones, the computer will already have paid for itself. From then on, I'll just be making more because I'm able to work faster.

Q Does the number of cores really matter for the kind of work you do? How much of your workload involves multitasking with several apps at once? Also, how many of the tools you use are multi-threaded processes?

GS I almost always am multitasking with several applications at once. It's necessary in the pipeline to jump back and forth between programs with big files loaded up on each one of them. Some tasks, like rendering and baking, will run all the cores up to 100%. Generally those tasks are the ones that take the longest, as well, so having the Intel Core i7-3970X Processor really makes a difference. On the other hand, some of the tasks can't use all six cores, so it's important to have the best "per-core" performance I can get! My processor has something called Intel

Turbo Boost that cranks up the frequency to increase the performance on each core. So, as with most use scenarios, the reality of it is that there will be a mix of applications that will use some or all your cores, the question is whether or not you want to be prepared for all of them! I'd always go for the Core i7-3970X.

Q So, how much difference would it make to you to have access to a PC like that (yours cost \$3,000) vs. using a loaner from the developer?

GS Like I stated earlier, since I am a contract artist, the faster I work the more I get paid. So the difference would be finishing on time or early rather than staying up all night waiting for bakes or renders to finish. Then I can work on more stuff and make more money. Or, since I finished so quickly, I could choose finally go to sleep! I could go spend time with friends, get a cute girlfriend, go play basketball, have a life!

Q That's a pretty dramatic comparison. More sleep, less waiting for tasks to complete, and—best of all—more income. How long would you say it would take for a monster PC like that to pay for itself, given the time you'd save and the increased income?

GS If you spent the extra time picking up more work instead of taking extra time off I'd say you could recover the cost in a little over a month worth of solid work.

Q That's incredible! Finally, what advice would you give to other freelancers or students that are entering the market when it comes to their computer choice?

GS When it comes to your work computer, the machine you will sit in front of for most of the day, the tool you will use to make a living, it doesn't make any sense to limit yourself and get any less than the best! ■



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lanfest.intel.com/events/lanfest-austin-winter-2012

All Night LAN - Lynwood, WA
www.gameclucks.com

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www.okggg.org

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Atlanta, GA

lanfest.intel.com/events/winter13

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lanfest.intel.com/events/mlp013-winter

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KansasLAN - Lyons, KS
www.kansaslan.com

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Let There Be LAN 4
Corvallis, OR

gaming.oregonstate.edu

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LANFest NETWAR 24.0
Omaha, NE

lanfest.intel.com/events/netwar-24

02.09.13

WV Gamers - Eugene, OR
www.wvgamers.com

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lanoc.org

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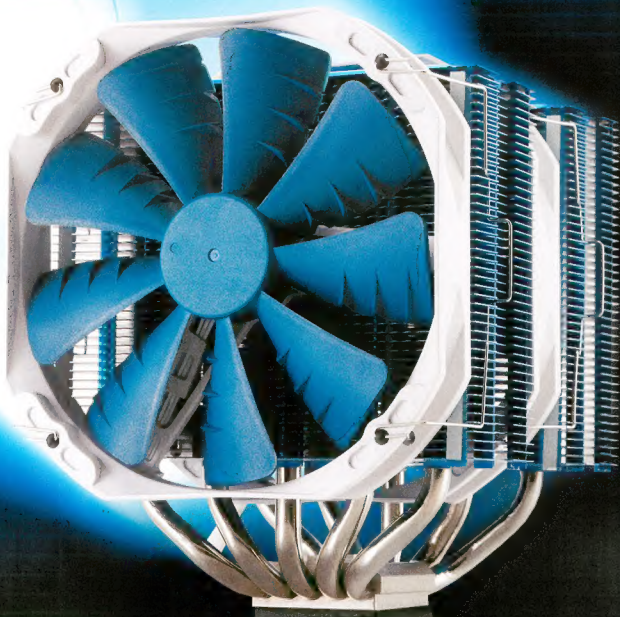
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Q&A With Hannes Wallin

Fractal Design's CEO Talks Cases & Scandinavian Design



Q Fractal has had a busy year! You updated the flagship Define series with the R4 and then added a window panel option, you unveiled the Node series, and you launched new power supplies and a new fan controller, as well. Where did all of that inspiration come from?

HW We have made huge investments in R&D, which are now paying off. We are a product-oriented company, and it's important for us to keep innovating and delivering. The inspiration comes from many different places, but I'd like to point out that our customers give us a lot of great feedback and ideas.

Q How has the response been so far to the Define R4, and roughly how many customers order it with the window panel vs. without?

HW We're overwhelmed with the positive response both from reviewers and end users, which reassures us that we are doing the right thing and building the already successful product language of Define R2/R3 into R4. Until now, we haven't had the windowed version available in all regions, so our sales data isn't really comparable, but it's safe to say that we reach out to a larger customer base by offering the side panel window option.

Q Obviously there's a pretty specific design ethos going on with Fractal Design products. How much of a role

does Fractal's Swedish origin play in the design process?

HW Our Swedish origin does play a significant role in our brand DNA, and we are spending a lot of effort to stay true to it. In order to remain focused, it means that sometimes we have to say no to some product ideas not fitting to our philosophy.

Q But there's clearly a pretty big emphasis on customer feedback, too, right? We'd have to guess that the R4's window panel option was at least partly due to requests from Fractal customers?

HW Sure, we have to strike a balance between maintaining our brand DNA and philosophy, as well as the market demand. The release of windowed side panel for Define series is a clear result from user requests.

Q Let's talk about Fractal's newest cases, the Node 304 and Node 605. They aren't your first small form factor cases, but they are pretty unique among the other cases in Fractal's lineup, aren't they? What were your goals for the Node series at the drawing board phase, and how well would you say your team did in achieving them?

HW With the Node series, we're creating a platform for small form factor cases that are able to cater to multitude of demands within that

segment. Our aim for the Node 304 was to take all the good things from its predecessor, the Array R2, which catered mostly to the WHS/NAS market, but widen the reach and compatibility of the product without unnecessarily increasing the size. I think we succeeded very well with that; it packs a ton of features and massive performance into a really small case volume. The Node 605 is designed around an innovative desktop format, with the goal of accommodating all of the HTPC setups out there. It's a stylish and feature-packed option, fitting nicely in your home theater component rack.

Q Our readers like SFF cases for a number of system types and usage scenarios, but they also like having room for high-end components, and the Node series cases make allowances for that. How difficult was creating space for good-sized graphics cards and PSUs when designing the 304 and 605?

HW Yes, the Node 304 especially required a lot of analysis and testing during its development to make sure we maximized the feature set while keeping the product incredibly compact. We fought for every inch and the end result is quite amazing in terms of feature/size efficiency. ■

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